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ERRATA.

Page 78	line 21	for “ *Platygaster* ”	read “ *Misocyclops* ”
,, 139	,, 46	,, “ *sequoia* ”	,, “ *sequoiae* ”
,, 148	,, 32	,, “ *gei*, Theo.”	,, “ *gei*, Koch ”
,, 154	,, 19	,, “ *Contarinia pyricola* ”	,, “ *Contarinia pyrivora* ”
,, 161	,, 30	,, “ *Mormordea* ”	,, “ *Mormidea* ”
,, 191	,, 24	,, “ *ochrogaster*, Gr.”	,, “ *ochrogaster*, Gn.”
,, 200	,, 15	,, “ *capitatus* ”	,, “ *quadratus* ”
,, 207	,, 33	,, “ *careuli* ”	,, “ *carueli* ”
,, 213	,, 8	,, “ 1926 ”	,, “ 1924 ”
,, 253	,, 33	,, “ *catanifer* ”	,, “ *catenifer* ”
,, 274	,, 9	,, “ *Parastichitis* ”	,, “ *Parastichtis* ”
,, 299	,, 10	,, “ VON TUBEUF (G.) ”	,, “ VON TUBEUF (C.) ”
,, 299	,, 27	,, “ *Bull. Soc. Zool. agric.*”	read “ *Rev. Zool. agric.*”
,, 299	,, 40	,, “ lxiii ”	read “ lxxiii ”
,, 316	,, 27	,, “ he regards *Habrocytus bedeguaris*, Thoms., as a synonym of *H.* (*Hypopteromalus*) *poecilopus*, Crawf.”	read “ He considers that the parasite recorded by Díaz in Spain as *Habrocytus bedeguaris*, Thoms., is *H.* (*Hypopteromalus*) *poecilopus*, Crawf.”
,, 323	,, 13	,, “ NEISWANDER (C. B.)	read “ NEISWANDER (C. R.) ”
,, 327	,, 40	,, “ (*fuscipes*, Zell.) ”	read “ (*fusciceps*, Zett.) ”
,, 333	,, 29	,, “ *Eucomyx* ”	,, “ *Eucomys* ”
,, 344	,, 32	,, “ arsenic acid ”	,, “ arsenic ”
,, 345	,, 41	,, “ [*R.A.E.*, xvi, 34]	,, “ [*R.A.E.*, A, xvi, 340] ”
,, 418	,, 39	,, “ *cinnamoni* ”	,, “ *cinnamomi* ”
,, 419	,, 25	,, “ *Opuntia monacantha* ”	read “ *Opuntia dillenii* ”
,, 445	,, 29	,, “ Verril ”	read “ Verrill ”
,, 448	,, 7	,, “ 1926–97 ”	,, “ 1926–27 ”
,, 506	,, 12	,, “ *Stagomantis* ”	,, “ *Stagmomantis* ”
,, 625	,, 33	,, “ *Melitomma* ”	,, “ *Melittomma* ”
,, 627	5 lines from end	for “ *Aleurodicus destructor*, which is also very harmful ”	read “ *Aleurodicus destructor. Aspidiotus destructor* is very harmful to coconut ”

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IMPERIAL BUREAU OF ENTOMOLOGY.

REVIEW
OF
APPLIED ENTOMOLOGY.

SERIES A.

VOL. XVI.] [1928.

SCHUBERT (W.). **Biologische Untersuchungen über die Rübenblattwanze,** *Piesma quadrata,* **Fieb., im schlesischen Befallgebiet.** [Biological Investigations on the Beet Leaf-bug, *Zosmenus quadratus,* in the Silesian Area of Infestation.]—*Z. angew. Ent.,* xiii, no. 1, pp. 128–155, 29 refs. Berlin, September 1927.

These investigations were concluded in 1923, but notice is taken of later papers [*R.A.E.,* A, xi, 434 ; xii, 438 ; xiii, 65].

The infestation of beet in Germany by *Zosmenus* (*Piesma*) *quadratus,* is due to this Tingid having migrated from wild Chenopodiaceae. The two areas chiefly affected are Silesia and Anhalt. *Z. quadratus* occurs with other insects, most frequently with Silphid and Cassidid beetles found on *Chenopodium* and beet. The commonest beet insect, *Aphis papaveris,* however, is rare in fields infested by the bug, but reinfests them when the latter disappears. Laboratory experiments appear to indicate that the bug avoids the Aphid. Another bug, *Coreus marginatus,* sometimes occurs with *Z. quadratus.* Coccinellid beetles do not attack the latter, only preying on Aphids.

The method of feeding and the conditions of activity of the bugs are described in detail. No eggs were laid at 3–6° C. [37·4–42·8° F.] and increasing temperatures caused an increase of eggs ; the maximum numbers were observed at 37–40° C. [98·6–104° F.]. Humidity decreases the numbers of eggs. Cold weather in March and April prolongs hibernation and wet weather in these months retards oviposition, so that the beet plants are already of vigorous growth when the infestation begins. Heavy soil promotes infestation and light soil is unfavourable to it. The life-cycle is discussed at length, a brief account having been published in a preliminary paper [A, x, 501]. The morphology of the various stages is also described.

A severe infestation of beet may result in the destruction of the crop. Other recorded food-plants are *Schoberia, Chenopodium, Salsola, Aster,* and *Atriplex,* while the author found that the bug will feed on *Polygonum, Raphanus, Sinapis, Thlaspi, Amaranthus,* cabbage and spinach, but does not attack potato, etc.

The clearance or treatment with insecticides of all wild Chenopodiaceae is a necessary condition for successful work against *Z. quadratus.* Attempts in Silesia to protect beet by growing potatoes round the fields failed, probably because the potato foliage only developed fully about three weeks after the bugs had appeared on the beet.

Hering (M.). **Beiträge zur Kenntnis der Oekologie und Systematik blattminierender Insekten. (Minenstudien viii.)** [Contributions to the Knowledge of the Ecology and Classification of Leaf-mining Insects.]—*Z. angew. Ent.*, xiii, no. 1, pp. 156–198, 27 figs., 11 refs. Berlin, September 1927.

This further part of a paper on leaf-mining insects chiefly from Germany [*R.A.E.*, A, xiv, 221] includes a key to the leaf-miners of birch and descriptions of new species from various plants not of economic importance.

Bodenheimer (F. S.). **Arbeitsstellen und Arbeiten auf dem Gebiete der angewandten Entomologie in Palästina.** [Institutions for and Work in Applied Entomology in Palestine.]—*Z. angew. Ent.*, xiii, no. 1, pp. 199–203. Berlin, September 1927.

An account is given of the organisation of work on medical and agricultural entomology in Palestine.

Silvestri (F.). **Probleme der landwirtschaftlichen Entomologie.** [Problems of Agricultural Entomology.]—*Z. angew. Ent.*, xiii, no. 1, pp. 203–210. Berlin, September 1927.

This is a translation of a paper already noticed from the Italian [*R.A.E.*, A, xiv, 98].

Kleine (R.). **II. Nachtrag der Gesamtliteratur der Borkenkäfer.** [Second Supplement to the Complete Literature of the Bark-beetles.]—*Z. angew. Ent.*, xiii, no. 1, pp. 218–242. Berlin, September 1927.

This is the second part of a bibliography already noticed [*R.A.E.*, A, xi, 203].

Walton (C. L.). **Some Observations on the Swede Midge in North Wales.**—*J. Minist. Agric.*, xxxiv, no. 6, pp. 547–551. London, September 1927.

An account is given of *Contarinia nasturtii*, Kieff. (swede midge) [*R.A.E.*, A, iii, 500], which caused widespread and serious damage to swedes in North Wales in 1926. The symptoms of attack were crumpling of the leaves, surface damage to the leaf blade, stalk and base, distortion of the young shoots, death of the leading shoot, the condition known as " many neck," caused by the growth of secondary shoots, and the rotting of " crown," " neck " and " bulb." In severe attacks all the symptoms were present. Under damp conditions rotting due to bacterial infection, aided by the accumulation of water in the hollows of the plant, followed the death of the leading shoot or severe damage to the leaf base. The bulk of the serious symptoms followed attack by the earlier broods of the midge when the plant tissues were young; later attacks appeared to be confined to the foliage and merely resulted in leaf-crumpling and slight local patches of decay. Early-sown rape was severely injured (in some cases 90 per cent. of the shoots rotted and the crops were much stunted) while late-sown crops escaped. Turnips were unaffected even when grown next to damaged swedes. Savoy cabbages were injured in several localities.

TRUELLE (A.). **La culture du pyrèthre de Dalmatie en France.**—*Vie agric. rur.*, xxxi, no. 37, pp. 174–175. Paris, 11th September 1927.

The method of cultivating pyrethrum in France is described, the recommendations being largely taken from the work of A. Juillet [*cf. R.A.E.*, A, xiii, 595, etc.].

LEMÉE (A.). **Le pyrèthre en France.**—*J. Soc. nat. Hortic. Fr.*, xxviii, pp. 288–291. Paris, 1927.

The author points out the value of pyrethrum as an insecticide and emphasises the desirability of its wider use and more extensive cultivation in France.

FINTZESCOU (G. N.). **Contributions à la biologie de la mouche à scie des rosiers** (*Hylotoma rosae* **D.G.**).—*Bull. Soc. ent. Fr.*, 1927, no. 11, pp. 180–183. Paris, 1927.

The sawfly, *Arge* (*Hylotoma*) *rosae*, L., is a serious pest of roses in parts of Rumania. The larva is parasitised by the Chalcid, *Pteromalus hylotomae*, which emerges from the host cocoon. The behaviour of the parasite in attacking the host is described. The infested larvae, which change from the usual pale green colour to orange, should not be destroyed.

LAING (F.). **Coccidae, Aphididae and Aleyrodidae.**—*Insects of Samoa*, pt. ii, fasc. 1, pp. 34–45, 3 figs. London, Brit. Mus. Nat. Hist., 25th June 1927.

The 36 Coccids recorded in this list of insects from Samoa include, in addition to those noticed previously [*R.A.E.*, A, iv, 128], *Pseudococcus brevipes*, Ckll.; *P. citri*, Risso, on lemons; *P. calceolariae*, Mask.; *P. cocotis*, Mask., on stems of coconut associated with ants; *P. comstocki*, Kuw., on leaves of *Pandanus*; *Trionymus sacchari*, Ckll.; *Coccus acuminatus*, Sign., on pineapple; *C. hesperidum*, L., on *Carica papaya*; *Pinnaspis minor*, Mask., on coconut and banana; *Aspidiotus cyanophylli*, Sign.; *A. destructor*, Sign., recorded as having been intercepted on coconuts imported into America; *A. lataniae*, Sign., on *Ptychosperma vitiensis*; *A. maskelli*, Ckll., and *Chrysomphalus ficus*, Ashm., intercepted on oranges imported into California; *C. buxtoni*, sp. n., on an unknown shrub; and *Melanaspis samoana*, Ldgr., on *Myristica hypargyraea*. The species recorded as *Aspidiotus lataniae* was recorded by Lindinger; if he based his determination on the description by Green in " The Coccidae of Ceylon," the record should refer to *A. destructor*. The author considers *Saissetia hemisphaerica*, Targ., to be a synonym of *S. coffeae*, Wlk.

The Aphids recorded are *Aphis gossypii*, Glov., on *Morinda citrifolia*; *A. laburni*, Kalt., on leguminous plants; *A. nerii*, Boy., on imported *Asclepias*; *A. tavaresi*, Del G., on lemon; and *Toxoptera aurantii*, Boy., on cacao and *Hibiscus tiliaceus*.

The Aleurodids are *Aleuroplatus* (*Orchamus*) *samoanus*, sp. n., on cultivated *Croton*; and *Neomaskellia bergii*, Sign., on sugar-cane.

van de Meer Mohr (J. C.). **Au sujet du rôle de certaines fourmis dans les plantations coloniales.**—*Bull. agric. Congo belge*, xviii, no. 1, pp. 97–106, 4 figs. Brussels, March 1927.

The author discusses the utilisation of *Oecophylla smaragdina*, F., against *Tessaratoma papillosa*, Dru., and other insect pests of *Citrus* in China [*R.A.E.*, A, xiii, 227], and of *Dolichoderus bituberculatus*, Mayr, against *Helopeltis* on cacao in Java [v, 570], where the occurrence of *Plagiolepis longipes*, Jerd. [v, 273] is one of the chief hindrances to the maintenance of *D. bituberculatus* in the cacao plantations.

Menzel (R.). **Ameisen als Bundesgenossen der Pflanzer.** [Ants as Allies of Planters.]—*Anz. Schädlingsk.*, iii, no. 10, pp. 111–114, 4 figs., 8 refs. Berlin, 15th October 1927.

An account is given of the use of *Dolichoderus bituberculatus*, Mayr, against *Helopeltis antonii*, Sign., and *H. theivora*, Waterh., on cacao in Java.

Nechleba (A.). **Verkümmern und Verderben von Bruten forstschädlicher Insekten.** [The Loss of Vitality and Destruction of Broods of Forest Insect Pests.]—*Anz. Schädlingsk.*, iii, no. 10, pp. 115–117, 1 fig. Berlin, 15th October 1927.

Among the factors ending outbreaks of forest pests must be included the gradual decrease and complete cessation of the power of reproduction noticed once a pest has reached its maximum abundance. Though this phenomenon may be closely connected with other causes, such as polyhedral disease in the case of *Lymantria* (*Liparis*) *monacha*, L., until fully investigated it must be regarded as an independent factor. This decrease of potency occurs in various insects and also in rodents and other small mammals. In insects it is evidenced in an unhealthy condition of the adults and in the loss of quantity and viability in the eggs, which either fail to hatch or produce larvae that fail to mature. Instances are quoted relating to *Porthetria* (*Liparis*) *dispar*, L., *Lymantria monacha*, Tachinid flies, and the Scolytid, *Myelophilus piniperda*, L.

Brassler (K.). **Massenauftreten von** *Phytodecta*-**Arten (Col. Chrysom.).** [An Outbreak of *Phytodecta* spp.]—*Anz. Schädlingsk.*, iii, no. 10, p. 117. Berlin, 15th October 1927.

In the districts around Berlin *Agelastica alni*, L., was exceedingly abundant on willow late in April and early in May. In the second half of May the young shoots of aspen [*Populus tremula*] were heavily infested with old adults and larvae of *Phytodecta rufipes*, F., and *P. viminalis*, L., including various aberrations of these species. *P. viminalis*, like *P. rufipes*, occurred on aspen and not on willow, the food-plant recorded in the literature, neither beetle attacking willows growing close by. The adults and larvae cling tenaciously to the leaves and are not likely to be shaken off.

HESSLER (—). **Beitrag zur Bekämpfung spiegelnder Ringelspinnerraupen.** [A Contribution to the Control of the larval Nests of *Malacosoma neustria*.]—*Anz. Schädlingsk.*, iii, no. 10, pp. 118–119, 2 figs. Berlin, 15th October 1927.

In experiments against the larvae of *Malacosoma neustria*, L., infesting apple in Hesse satisfactory results were obtained by spraying the nests with a strong solution of carbolineum. A 17 per cent. solution was applied with the nozzle of the sprayer about 4–8 inches from the nest.

BECKER (J.) & BLUNCK (H.). **Die Getreideblumenfliege in ihre Beziehungen zu Nässe, Bodenart und Vorfrucht.** [The Wheat Bulb Fly in its Relation to Moisture, Type of Soil and preceding Crop.] —*Landw. Wbl. Schles.-Holst.*, lxxvii, no. 40, pp. 1129–1133. Kiel, 1927.

During recent years *Hylemyia coarctata*, Fall., has increased in importance in Schleswig-Holstein, where it is a pest of rye rather than of wheat, as it prefers light soils. Heavy soils are not infested if they are damp, and moisture favours fungous infections to which all stages are liable. The eggs are laid in June and do not hatch till the following March. The fly oviposits in bare ground, and if a crop that does not quickly cover the ground precedes rye, the latter suffers severely. Rye seed must be disinfected to prevent attack by a *Fusarium* that weakens the plants and renders them incapable of resisting *H. coarctata* ; on light soil rye must not follow fallow, early potatoes, swedes, or buckwheat [*Fagopyrum esculentum*].

EISENMENGER (K.). **Zur Frostspannerfrage.** [On the Question of the Winter Moth.]—*Bad. Bl. angew. Ent.*, ii, no. 4, pp. 224–225. Freiburg i. Br., October 1927.

Observations made in Baden on the winter moth [*Cheimatobia brumata*, L.] lead to the following suggestions : Bands must be applied about mid-October and at a height of 18–24 inches instead of 3–5 feet, as this prevents females from being carried by males to the top of the tree [*cf. R.A.E.*, A, xv, 166]. As oviposition is completed by the middle of December, the bands should be removed at the end of the month or early in January instead of at the end of February, and the trunk below the place of banding should be painted immediately with 25 per cent. carbolineum. If the trees are also sprayed with a good insecticide before and after blossoming, no injury from the winter moth need be feared.

STELLWAAG (F.). **Forschungen über die Epidemiologie des Heu- und Sauerwurms** (*Clysia ambiguella* **und** *Polychrosis botrana*). [Investigations on the Epidemiology of the Spring and Summer Generations of *C. ambiguella* and *P. botrana*.]—*Verh. deuts. Ges. angew. Ent., 6. Mitgliederversamml. Wien 28.Sept.–2.Okt. 1926*, pp. 17–28, 6 figs. Berlin, 1927.

A study of the vine-moths, *Clysia ambiguella*, Hb., and *Polychrosis botrana*, Schiff., during the past ten years, chiefly in the Rhine Palatinate, shows that region to be one where both species find very favourable conditions, not only as regards climate, but also because its scanty fauna does not include the parasitic Hymenoptera and Diptera in the absence of the necessary intermediate hosts. The abundance of the moths is governed by the weather, so that no reliable forecast of the infestation can be made.

Sprengel (L.). **Massenauftreten und Grossbekämpfung des Heu- und Sauerwurmes** (*Clysia ambiguella* **Hübn. und** *Polychrosis botrana* **Schiff.) in der Pfalz.** [The Outbreaks and Control on a large Scale of the Spring and Summer Generations of *C. ambiguella* and *P. botrana* in the Rhine Palatinate.]—*Verh. deuts. Ges. angew. Ent., 6. Mitgliederversamml. Wien 28.Sept.–2.Okt. 1926*, pp. 37–44, 4 figs. Berlin, 1927.

The information in this paper has already been noticed [*R.A.E.*, A, xiv, 376 ; xv, 384].

Leuzinger (H.). **Die Arsenfrage in der Schweiz.** [The Arsenic Question in Switzerland.]—*Verh. deuts. Ges. angew. Ent., 6. Mitgliederversamml. Wien 28.Sept.–2.Okt. 1926*, pp. 44–48. Berlin, 1927.

In Switzerland the free use of arsenical insecticides is hampered by legislative restrictions, the legislation being largely enacted by the various individual cantonal republics forming the Confederation. The text is given of the regulations, dated 31st March 1926, governing the use of these insecticides in the canton of Valais, and also the results of experiments made by the author there, which show the great value of lead arsenate against the vine-moths, *Clysia ambiguella*, Hb., and *Polychrosis botrana*, Schiff.

Fulmek (L.). **Ueber die Situation der Schädlingsbekämpfung in den Tabakkulturen auf Sumatra.** [The Position of Work against Tobacco Pests in Sumatra.]—*Verh. deuts. Ges. angew. Ent., 6. Mitgliederversamml. Wien 28.Sept.–2.Okt. 1926*, pp. 49–55. Berlin, 1927.

Much of the information in this paper has already been noticed [*R.A.E.*, A, xiv, 326, 590 ; xv, 310, etc.].

The chief pests of tobacco in Sumatra are the Noctuids, *Prodenia litura*, *Heliothis assulta* and *Phytometra signata*, an Aphid, *Myzus persicae*, and a Capsid, *Engytatus* (*Cyrtopeltis*) *tenuis* [*cf.* *R.A.E.*, A, xiv, 622]. These pests are polyphagous, a point of interest because in Deli tobacco is grown yearly on one-eighth of the land only, the other seven-eighths being left to be overgrown by wild plants. It is therefore surprising that other pests have not appeared in numbers on tobacco. The Pyralid, *Pachyzancla ambitalis*, which occurs on the seed-beds, appears to be a pest in the process of establishing itself on this crop.

WAHL (B.). **Der Pflanzenschutz in Oesterreich.** [Plant Protection in Austria.]—*Verh. deuts. Ges. angew. Ent., 6. Mitgliederversamml. Wien 28.Sept.–2.Okt. 1926*, pp. 67–78. Berlin, 1927.

The warm and dry eastern parts of Austria are those chiefly subject to infestation by injurious insects. The chief pests of the vine are *Phylloxera*, the vine-moths [*Clysia ambiguella*, Hb., and *Polychrosis botrana*, Schiff.], *Sparganothis* (*Oenophthira*) *pilleriana*, Schiff., and a gall-mite. Orchard pests include *Psylla mali*, Schm., in Tyrol, *Argyresthia ephippiella*, F., in Lower Austria, and *Lecanium corni*, Bch., which is controlled with a 10 per cent. solution of carbolineum. The woolly aphis [*Eriosoma lanigerum*, Hausm.] is also treated in winter with carbolineum, and recently attempts have been made to establish its parasite, *Aphelinus mali*, Hald. Field pests include *Phlyctaenodes sticticalis*, L., and the weevil [*Bothynoderes punctiventris*, Germ.] on beet ; and *Hylemyia coarctata*, Fall., *Mayetiola destructor*, Say, *Oscinella* (*Oscinis*) *frit*, L., *Chlorops* [*taeniopus*, Mg.] and *Lema* [*melanopa*, L.] on cereals. No specific potato pests of importance occur in Austria. Forest pests include bark-beetles and *Hylobius* and are usually combated by cultural measures.

The chief authority on plant protection is the Ministry for Agriculture and Forestry. The Federal Institute for Plant Protection, Vienna, undertakes the inspection of plant nurseries, the examination of insecticides and fungicides, and the supervision of the export of plants, except forest plants, which are dealt with by the Federal Forestry Institute at Mariabrunn. Questions relating to applied entomology are also investigated by the Natural History Museum, Vienna.

ZWEIGELT (F.). **Der Maikäfer in Oesterreich.** [*Melolontha* in Austria.] —*Verh. deuts. Ges. angew. Ent., 6. Mitgliederversamml. Wien 28.Sept.–2.Okt. 1926*, pp. 81–98, 4 maps. Berlin, 1927.

Much of the information contained in this paper, which is the result of fifteen years observations in Lower Austria and Bukovina, has already been noticed [*R.A.E.*, ii, 640 ; vii, 254 ; xiv, 416]. Details are given of the occurrence of *Melolontha melolontha* and *M. hippocastani* in the various districts, as affected by temperature and altitude. The rate of development depends on the climate. All the individuals in a given district are genetically connected, but all those flying contemporaneously in a given year do not necessarily belong to the same "race." For this reason the word "race" [Stamm] is not used here by the author ; he points out that to justify the erection of biologically differentiated races it must be proved that no change in rate of development is possible within one and the same race, and he denies the existence of such races. As regards the cessation of mass-development in southern Europe, it is possible that the disappearance of *M. melolontha* and *M. hippocastani* there may be actually due to too favourable, *i.e.*, high, temperatures. It would seem that these species require the interpolation of long rest-periods (hibernation). The most important work that now requires to be done is to obtain accurate measurements of the soil-temperatures in the northern regions where infestations occur, and to determine the southern limits of distribution and the causes governing it.

ZWÖLFER (W.). **Die Pebrine des Schwammspinners** (*Porthetria dispar*, **L.**) **und Goldafters** (*Nygmia phaeorrhoea*, **Don.**=*Euproctis chrysorrhoea*, **L.**), **eine neue wirtschaftlich bedeutungsvolle Infektionskrankheit.** [The Pebrine of the Gipsy Moth and of the Browntail Moth, a new Infection of Economic Importance.]—*Verh. deuts. Ges. angew. Ent., 6. Mitgliederversamml. Wien 28.Sept.–2.Okt. 1926*, pp. 98–109, 3 figs. Berlin, 1927.

A briefer account of these observations has already been noticed [*R.A.E.*, A, xv, 385].

Amtliche Pflanzenschutzbestimmungen. [Official Regulations on Plant Protection.]—*NachrBl. deuts. PflSchDienst.*, Beilage no. 11, pp. 189–212. Berlin, 1st October 1927.

The measures recorded in this issue include the German regulations on the use of highly poisonous insecticides and fungicides ; the Brazilian regulations on the importation and transit of plants ; the Luxemburg regulations against the importation of *Rhagoletis cerasi* in cherries from France ; the Hungarian regulation against the importation of the Colorado potato beetle [*Leptinotarsa decemlineata*] ; and the Danish law no. 140 of 1st July 1927 relating to measures against diseases and pests of plants, together with the Danish regulations of 21st July 1927 concerning the importation of plants and parts of plants.

Decree of 31st March 1924, concerning the Importation of Potatoes into Denmark.—*U.S. Dept. Agric., Fed. Hortic. Bd.*, S.R.A., no. 90, p. 52. Washington, D.C., May 1927.

Importation of potatoes into Denmark may not take place from countries where attacks of potato wart or of *Leptinotarsa* (*Doryphora*) *decemlineata* (Colorado beetle) have occurred, unless satisfactory evidence is produced that the country in question has again become free from infestation.

[SHUVALOV (P.).] **Шувалов (П.). The Causes of the Decline of Pine Plantations** (*Pinus silvestris*) **in the Borovoe Experimental Forest of the Samara Government.** [*In Russian.*]—Izvest. Kasansk. Inst. S. Kh. i Lesovodst. [*Bull. Kazan Inst. Agric. & Forest.*], ii, pt. 6, pp. 76–83, 4 refs. Kazan, 1926. (With a Summary in German.) [Recd. September 1927.]

During 1923 young pines (9–20 years old) began to wither, although they had apparently withstood the drought of 1920 and 1921. By 1925 over two-thirds of the trees in a forest of nearly 1,000 acres had succumbed. Investigations revealed a widespread infestation by *Melolontha hippocastani*, F., the intensity of which varied considerably in different parts of the forest and was in direct relation to the proportion of dead trees. Where as many as 60 per cent. of the trees were healthy, only about 4 larvae were found to the square yard, but among the dead trees as many as 40 were found. The roots of the dead trees were severely attacked, the fibrous roots being completely destroyed. The severity of the infestation may be explained by the fact that the usual measures of collecting and destroying the beetles had been neglected since 1916.

Other insect pests occurring in the forest included *Ips acuminatus*, Gyll., *Aradus cinnamomeus*, Pnz., and *Polyphylla fullo*, L., none of which, however, caused any appreciable damage.

MILES (H. W.). **The Agricultural Entomology of the Holland Division of Lincolnshire.**—*Lincs. Nat. Union Trans.*, 1926, pp. 129–148. Lincoln, 1927.

Notes are given on insects of economic importance observed in the Holland Division of Lincolnshire during 1923–25. A wide range of crops is grown there, and the pests mentioned include nearly 40 species of Coleoptera, 33 Rhynchota, and 44 Lepidoptera, while about 20 Diptera are of importance as injurious or beneficial insects. In addition to the many well-known pests, the following are recorded: *Kakothrips pisivorus*, Westw. (*robustus*, Uz.), which was abundant on young pea-pods in 1923; the Capsid, *Phytocoris populi*, L., *Polia* (*Hadena*) *pisi*, L., *Smerinthus ocellatus*, L., and *Blastodacna atra*, Haw., on apples; *Olethreutes lacunana*, Schiff., on strawberries; the Tineid, *Epermenia chaerophyllella*, Goeze, which caused leaf injury to parsnips; the Telephorid, *Malachius bipustulatus*, L., apparently feeding on the pollen of mustard blossom; the Elaterid, *Dolopius marginatus*, L., a species usually associated with oak woods, the larvae of which damaged the roots of spring cabbage; the Halticid, *Longitarsus ochroleucus*, Mshm., and the weevil, *Phyllobius virideaeris*, Laich., the larvae of which fed at the roots of strawberries; *Ceuthorrhynchus contractus*, Mshm., on mustard seedlings; *Geotrupes stercorarius*, L., the larvae of which were found at the roots of strawberries and fruit bushes; *Amphimallus* (*Melolontha*) *solstitialis*, L., the larvae of which occurred frequently at the roots of fruit bushes and flowering plants on new land; the Anthomyiid, *Phorbia* (*Chortophila*) *fugax*, Mg., damaging cabbages; *Lonchaea chorea*, F., which was reared from unhealthy mangels; and *Phytomyza atricornis*, Mg., abundant on chrysanthemums and particularly troublesome on cuttings.

The Hymenoptera recorded include the sawfly, *Cladius pectinicornis*, Fourcr., the larvae of which fed on the leaves of strawberries, and the following parasitic species: the Ichneumonids, *Herpestomus brunnicornis*, Grav., parasitic on *Hyponomeuta* spp., *Pimpla pomorum*, Ratz., on *Anthonomus pomorum*, L., *P. brassicariae*, Poda, on *Notolophus* (*Orgyia*) *antiquus*, L., *P. alternans*, Grav., on *Oxygrapha comariana*, Zell., *Glypta bicornis*, Boie, on Tortricids, *Ophion mocsáryi*, Brauns, on *Notolophus antiquus*, *Angitia fenestralis*, Holmgr., on *Plutella maculipennis*, Curt., and *Thersilochus morionellus*, Holmgr., on *Meligethes aeneus*, F.; the Braconids, *Rhogas circumscriptus*, Nees, on *Cydia pomonella*, L., *Microplitis ocellatae*, Bch., on *Smerinthus ocellatus*, *Apanteles* (?) *obscurus*, Nees, on *Epermenia chaerophyllella*, *A. picipes*, Bch., on *Phlyctaenia* (*Pionea*) *forficalis*, L., *A. impurus*, Nees, on Tortricids, and *Coelinius niger*, Nees, on *Chlorops taeniopus*, Mg.; and the Chalcidids, *Ageniaspis fuscicollis*, Dalm., on *Hyponomeuta* spp., and *Copidosoma tortricis*, Wtrst., on *Oxygrapha comariana*. The Tachinid parasites have already been noticed [*R.A.E.*, A, xiii, 451].

DUFFIELD (C. A. W.). **Wood Wasps.**—*Gdnrs.' Chron.*, lxxxii, no. 2131, p. 348, 1 fig. London, 29th October 1927.

Sirex noctilio, F., and *S. gigas*, L., are frequently found in England, their numbers being augmented each year from shipments of timber from abroad. The eggs are laid under the bark of conifers, unhealthy ones generally being attacked. The larvae bore into the hard wood, usually pupating just under the bark, and the adults emerge the following summer. They may be found as late as November. In the pine forests of Germany and northern Europe these wood-wasps often cause serious losses, but in Britain they seldom occur in sufficient numbers to do much damage.

SPEYER (E. R.). **The Chrysanthemum Midge.**—*Gdnrs.' Chron.*, lxxxii, no. 2133, pp. 388–389, 4 figs., 1 ref. London, 12th November 1927.

Diarthronomyia hypogaea, Lw. (chrysanthemum midge) has been known in England for some years as infesting the wild ox-eye daisy [*Chrysanthemum leucanthemum*]. In 1915, probably after exportation from Europe, it became established on cultivated chrysanthemum in the United States, and has been a serious pest there ever since, but in Britain it was first recorded as attacking chrysanthemum in April 1927. It remained dormant during late spring and summer, but increased considerably in September. The larval stage of the fly averages 4 weeks, the pupal stage 2 weeks and the adult life 36 hours. Since the fly cannot travel long distances, its spread may be prevented by limiting movement of plants that are infested or have been grown in infested greenhouses. Though a variety of chrysanthemum imported about three years ago from the United States is susceptible to attack and though, with one exception, the midge was found in all nurseries examined where this variety was grown, there is no absolute evidence that the outbreak is due to infested cuttings introduced from America. Chrysanthemums grown out of doors during the whole summer and autumn showed no signs of attack, except once in the case of the imported variety, in which a few galls were present on young plants.

Further notes on the biology of this pest and methods of control have been taken from a paper already noticed [*R.A.E.*, A, xiii, 121].

The Destructive Insects and Pests (Amendment) Order of 1927.—*Statutory Rules & Orders*, 1927, no. 1129, 2 pp. London, 24th November 1927.

The Destructive Insects and Pests Order of 1922 [*R.A.E.*, A, x, 536] is amended to include all unrooted cuttings and rooted plants of chrysanthemums in the list of plants the importation of which into England and Wales is restricted, and to include *Diarthronomyia hypogaea*, Lw. (chrysanthemum midge) in the list of pests the compulsory control of which may be required.

[**Reports on the State of Crops in each Province in Spain from 15th August to 15th September 1927.**]—*Bol. Agric. técn. econ.*, Sec. oficial, xix, no. 225, pp. 814–838. Madrid, 30th September 1927.

The pests recorded are the vine moth, *Polychrosis botrana*, Schiff., and *Ceratitis capitata*, Wied., in Almeria; *Coccinella septempunctata*, L., on melons, in Badajoz; and *Tetranychus telarius*, L., on potatoes, and *Liothrips* (*Phloeothrips*) *oleae*, Costa, on olives in Ciudad Real.

Deshusses (L. A. & J.). **Correction à la méthode d'Avery-Beans pour le dosage de l'arsenic dans les verts de Schweinfurth.**—*Arch. Sci. phys. nat.*, (5) ix, pp. 83–86. Geneva, July–August 1927.

An improved method of estimating the amount of arsenic in Paris green is described.

Staudinger (H.), Ruzicka (L.) & Reuss (E.). **Insektentötende Stoffe. 11. Mitteilung.** [Insect-killing Substances. 11th Communication.]—*Ann. Acad. Scient. fenn.*, Ser. A, xxix, no. 17, 8 pp. Helsingfors, 1927.

Staudinger (H.) & Harder (H.). **Insektentötende Stoffe. 12. Mitteilung.**—*T.c.*, no. 18, 14 pp.

The preceding papers of this series have been noticed [*R.A.E.*, A, xiii, 298, 299]. The first of the present papers deals with the chemical constitution of pyrethrine, the active principle of pyrethrum. The preparation of this substance synthetically does not seem practicable, because any change in the chemical structure of pyrethrine removes its insecticidal efficiency. The second paper deals with methods for determining the pyrethrine content of Dalmatian insect powder [prepared from the flowers of *Chrysanthemum cinerariaefolium*], a matter of importance because the possibility of breeding plants with a high content of pyrethrine may provide the means for cheapening the cost of the insecticide, which appears to be impossible chemically. The methods used for the extraction and titration of the pyrethrine content are described.

Klevenhusen (F.). **Beiträge zur Kenntnis der Aphidensymbiose.** [Contribution to the Knowledge of Symbiosis in Aphids.]—*Z. Morph. Oekol. Tiere*, ix, no. 1–2, pp. 97–165, 2 pls., 41 figs., 26 refs. Berlin, 1st October 1927.

This is a study of symbiotic organisms associated with the pseudovitellus in Aphids.

Müller (K.). **Beiträge zur Biologie, Anatomie, Histologie und inneren Metamorphose der Thripslarven.** [Contribution to the Biology, Anatomy, Histology and internal Metamorphosis of Thrips Larvae.]—*Z. wiss. Zool.*, cxxx, no. 1–2, pp. 251–303, 1 pl., 27 figs., 54 refs. Leipzig, November 1927.

The greater part of this paper deals in detail with the internal and external anatomy of the larvae of thrips. Heliotropism and moulting, chiefly in regard to *Parthenothrips dracaenae*, Heeg., are discussed.

Priesner (H.). **Die Thysanopteren Europas. Abteilung III.**—pp. 343–570, 2 pls. Vienna, Fritz Wagner, 1927. Price *M.*24.

Previous parts of this treatise have been noticed [*R.A.E.*, A, xiv, 308; xv, 64]. The main section on specific morphology and classification is continued, including descriptions of one new subfamily, eight new tribes, one new genus, one new subgenus, four new species and fifteen new forms.

MICHA (I.). **Beitrag zur Kenntnis der Scoliiden (Hym. Acul.).** [A Contribution to the Knowledge of the Scoliidae.]—*Mitt. zool. Mus. Berlin*, xiii, no. 1, pp. 1–156, 42 figs., 14 refs. Berlin, June 1927.

This paper on the morphology and classification of certain genera of the SCOLIIDAE includes a discussion of the generic synonymy of the family and a brief chapter on the biology and economic importance of these wasps.

VAYSSIÈRE (P.). **Le problème acridien.**—*Matér. Étude Calamités*, iv, no. 14, pp. 159–173, 17 refs. Geneva, July–September 1927.

This is a review of the locust and grasshopper situation in various countries during 1926 and the early part of 1927, based on official reports. A review of the progress in research on ACRIDIDAE is also given, special attention being paid to discussing Plotnikov's paper on phases in *Locusta migratoria* [*R.A.E.*, A, xv, 162], which is not considered convincing.

PATTERSON (W. H.). **Suggestions for the Control of Termites or White Ants in Buildings.**—*Bull. Gold Coast Dept. Agric.*, no. 1, 17 pp., 2 pls., 28 refs. Accra, October 1925. [Recd. 1927.]

This is a general survey of the situation with regard to termite infestation and of the remedies that have been successfully used in various parts of the tropics, the information having been largely compiled from this *Review*. Suggestions are made for the protection of future buildings in the Gold Coast, for the elimination of termites from infested buildings, and for lines of future experimental work in this connection.

POMEROY (A. W. J.). **Report on the Economic Importance of the Damage due to Termites or White Ants in Accra and Achimota on the Gold Coast and the Methods by which this Loss may be curtailed.**—Fol., 21 pp., 11 pls., 2 plans. Accra, Govt. Printer, 1927. Price 2*s*.

Termite infestation at Accra and Achimota, Gold Coast, is so extensive that it is almost impossible to find an area of 10 square yards of ground that does not show signs of termite activity, while the loss to property is estimated at thousands of pounds annually. There are only a few species of serious economic importance in the Gold Coast, all of which are subterranean in habit. The most important are *Coptotermes truncatus*, Wasm., var. *reductus*, Sjöst., *Termes pauperans*, Silv., *Acanthotermes* (*Pseudacanthotermes*) *minor*, Sjöst., *Ancistrotermes amphidon*, Sjöst., *Microtermes sudanensis*, Sjöst., and possibly one or two undescribed species of *Microtermes*. *Macrotermes* (*Amplitermes*) *natalensis*, Hav., which attracts much attention on account of its gigantic mounds, is of little economic importance, as it subsists almost entirely on the bark and dead wood of trees and shrubs. A list is given of 53 species of termites known in the Gold Coast ; a number of new species found by the author await description, and doubtless further species will be discovered.

The biology and methods of nest construction of the commoner species are described, and the results of chemical analyses of the fungus gardens and carton nests of several species are given. Natural control in the regions in question is limited to attacks of lizards, the snake, *Leptotyphlops bicolor*, which is commonly found inside the nests, and driver ants (*Dorylus* spp.) and Ponerine ants. The chief reasons for the abnormal degree of termite infestation are probably the scarcity of natural enemies and the fact that increase in building entails the production of large supplies of very palatable food. The radius of flight appears to be distinctly limited, and the evidence indicates that if a controlled zone of half a mile in width is maintained between the freed and infested areas, under normal conditions reinfestation will not take place.

Recent experimental work indicates that the destruction of nests is a practical and economic measure of control, and tests are being carried out to determine the value of certain poisons and also the cost of the operations. In the large mounds constructed by *Macrotermes natalensis* the interior is hollow and partly filled with a comb-like structure of cemented earth, and all living termites within the nest can be readily destroyed by the fumes of burning sulphur and arsenic applied by means of a special apparatus [*R.A.E.*, A, iii, 504; xv, 23] consisting of a brazier and pump, the cost being about 6*d.* for each nest. Composite nests (containing colonies of several species) cannot be fumigated until their structure has been broken up. Gelignite has been found best for this purpose, dynamite being too uncertain and gunpowder too expensive and lacking in lifting power. The explosive is placed in holes bored in the nest, the average number of holes required for a nest being six, larger nests requiring nine, and smaller ones five. The lateral holes should be 3 ft. deep, and directed towards the centre at an angle of 45° with the surface; the central hole should be 3ft. 6 in. deep, and vertical, and its charge should be provided with a longer fuse, so that it explodes last, forming a crater in the centre. Eight sticks of gelignite should be used in each lateral hole and ten in the central one. The method of boring the holes with a hand auger is explained, as well as the use of a power driller, which, however, is much more expensive and troublesome. If, after being blown up, the nests require fumigation, they should be covered with a large tarpaulin, the edges of which are weighted down with earth; the fumes of burning arsenic and sulphur, hydrocyanic acid gas or chlorine gas can then be introduced. The use of arsenic and sulphur has been very successful near dwellings, as the fumes quickly disperse in the air; chlorine, being heavy, should be the most efficacious, but has not actually been tried. After the destruction and fumigation of the nests the ground should be ploughed or hand ridged and treated with some poison, such as sodium arsenite, sodium cyanide or arsenic mixed with dry earth or sand, or preferably road dust. As dry chemicals were not available for this purpose, the following substitutes were tried: 160 lb. sodium cyanide to 12,000 gals. water, this quantity being used on 1 acre; Cooper's sheep dip, 1 part to 50 of water, used at 1,750 or 3,000 gals. to the acre; and a stock solution of 4 gals. kerosene boiled with 1 lb. soap and 2 gals. water, diluted to the strength of 1 part stock solution to 9 parts water, used at 1,350 gals. to the acre. If operations are carried out on a large scale, the shortage of water will necessitate the use of dry poisons, which can be applied by a hopper attached to or following the plough. The working costs of the treatment of land for the extermination of termites in both Accra and Achimota have been calculated and are tabulated.

The problem of termite infestation in buildings has two aspects, namely, the insulation of buildings so that attack by subterranean species is impossible, and the elimination of termites in buildings already infested. Houses in Accra that are built on iron piers and a framework raised from the ground are not attacked by termites. Another type of protection has been devised, in which tarred felt and asphalt are the insulating agents, but it is not known how long the repellent qualities of the tarred felt will be maintained. In this connection it is stated that some old felt impregnated with tar and containing 60 per cent. tar residue was devoured by *Termes pauperans* and *Microtermes* spp., the tar passing through the alimentary canal of the termites without affecting them appreciably. Where it is impossible to replace wooden structure by iron or concrete, and resistant timbers cannot be used, wood for buildings should be treated with creosote under high pressure (at least 20 lb. to the square inch). Access to buildings is often gained before the concrete or cement has become hard enough ; by using 2 per cent. [sodium] cyanide in the water with which it is mixed the termites can be repelled until the cement is sufficiently resistant. The quality of concrete construction is of considerable importance, but concrete cannot be made absolutely impenetrable to termites, as it inevitably cracks in tropical climates ; moreover, certain termites, such as *Coptotermes truncatus* var. *reductus*, secrete from a frontal gland an acid fluid that enables them to penetrate concrete that is in contact with the ground.

When houses are heavily infested all woodwork should be examined and tapped with a hammer to detect infested portions, which should be destroyed. The cement floor should then be broken up and the earth dug out to a depth of at least 2 ft. 6 in., after which the space should be drenched with a strong solution of sodium cyanide, say 3 per cent., and a similar treatment given to each layer of earth 1 ft. deep replaced. On the outside a trench should be dug to a depth at which no further signs of activity are observed, and as near to the foundations as safety will permit. The subjection of the base of walls to intense heat by means of " Wells Heaters " seems to have an appreciable effect. Hydrocyanic acid gas fumigation in rooms has been tried, but the gas evidently requires some considerable time to penetrate the galleries and chambers hollowed out in the wood. It is suggested that certain badly infested areas on which it is proposed to build should be temporarily isolated by trenches properly treated with [sodium] cyanide and afterwards filled in.

Poison baits consisting of waste wood saturated with a 10 per cent. solution of sodium arsenite are suggested for use in badly infested areas ; calomel is also toxic to termites, and being insoluble, passes through with the excreta, which are eagerly devoured by other termites, as are also dead individuals. It is considered that a combination of carefully considered and tested scientific methods will be the only method of dealing successfully with termite infestation.

GARRETSEN (A. J.). **Verslag over een bezoek aan Britsch-Indië in verband mit het *Helopeltis*-vraagstuk.** [Report on a Visit to British India in Connection with the *Helopeltis* Problem.]—*Arch. Theecult. Ned.-Ind.*, no. 1, pp. 7–63, 8 pls., 2 maps. Buitenzorg, July 1927. (With a Summary in English.)

This visit was made in 1923 to Assam and Bengal for the purpose of investigating *Helopeltis* on tea, particularly the connection between its incidence and the relative values of assimilable potash and phosphoric acid in the soil. The conditions there and in the Dutch East Indies are compared. It is considered that so far it is impossible to decide how much any special constituent of the soil may be connected with the pest. Potash manure has no effect on it.

The species of *Helopeltis*, occurring in India is *H. theivora*, Waterh., which is not considered harmful in Java. The red spider, *Tetranychus bioculatus*, W.M., occurs at far higher altitudes than in the Dutch East Indies, where at these altitudes the orange mite, *Brevipalpus obovatus*, Donn., is more troublesome. Leaf-rollers occur, but not to any serious degree, and also the Jassid, *Empoasca flavescens*, F. (tea green-fly).

KLEINE (R.). **Neuere biologische Beobachtungen an Brenthiden.** [Recent biological Observations on Brenthids.]—*Ent. Bl.*, xxiii, no. 3, pp. 123–126, 1 fig. Berlin, 30th September 1927.

The Brenthid beetles, *Hypomiolispa trachelizoides*, Senna, *Schizotrachelus cameratus*, Lacord., and *Opisthenoplus famulus*, Kleine, have been found in Malaya in the bark of *Dyera*, a tree that produces a latex forming the base of chewing gum.

HAYNES (A. S.). **Annual Report on the Department of Agriculture S.S. and F.M.S. for the Year 1926.**—*F.M.S. Govt. Gaz.*, 5th August 1927, Suppmt., 17 pp. Kuala Lumpur, 1927.

The insects recorded in the course of this report, with the exception of *Nymphula depunctalis*, Guen., and *Gryllotalpa* (*Curtilla*) *africana*, P. de B., attacking rice, were mentioned elsewhere [*R.A.E.*, A, xv, 656].

De klapperrups in Koelon Progo (Vorstenlanden). [The Coconut Caterpillar in the Koelon Progo District of the Vorstenlanden Region, Java.]—*Algem. LandbWkBl. Ned.-Ind.*, xii, no. 10, pp. 335–336. Bandoeng, 3rd September 1927.

A serious infestation of coconut by the Hesperiid, *Hidari irava*, Moore, affecting some 35,000 palms, has occurred in Java. The best measure is cutting off infested leaves. Spraying with an insecticide, such as Paris green, is too expensive. A scarcity of crows owing to an epidemic disease is believed to be an indirect cause of the outbreak.

DE JONG (A. W. K.). **Verslag** [Report] **van den Directeur van het Algemeen Proefstation der A.V.R.O.S., 1 Juli 1926-30 Juni 1927.**—*Meded. algem. Proefst. Avros.*, Algem. Ser. no. 32, 40 pp. Medan, Sumatra, 1927.

In one plantation the caterpillars of *Tiracola* (*Arcilasisa*) *plagiata*, Wlk., severely injured the leaves and bark of young *Hevea*, the infestation being due to the normal food-plant, *Ballota*, being completely defoliated. *Saissetia* (*Lecanium*) *nigra*, Nietn., occurred on *Hevea* seedlings. The Limacodids, *Orthocraspeda trima*, Moore, *O. sordida*, Snell., and *Setora nitens*, Wlk., infested oil palms [*Elaeis guineënsis*], but were checked by natural enemies. Scattered infestations by the weevil, *Rhynchophorus ferrugineus*, F., did little injury to the palms. Tea pests included the leaf-roller, *Cydia* (*Laspeyresia*) *leucostoma*, Meyr. *Zeuzera coffeae*, Nietn., was an occasional pest of coffee. Leaf-cutting bees, *Megachile*, defoliated gutta-percha [*Palaquium*]; the only remedy is to keep green manure plants cut down to prevent flowering, because these bees feed their larvae on the pollen. The caterpillars of the Thyridid, *Rhodoneura myrtaea*, Dru., also injured gutta-percha.

Stening (H. C.). **Copper Carbonate prevents Weevil Infestation.**—*Agric. Gaz. N.S.W.*, xxxviii, pt. 8, p. 589. Sydney, August 1927.

Tests conducted in Sydney in 1926–27 showed that stored wheat treated with copper carbonate at the rate of 2 oz. of powder to the bushel was completely free from weevil infestation after being stored for twelve months, while untreated wheat was heavily infested. In a bag containing half treated and half untreated wheat, the treated portion remained uninfested, and weevils migrating from the untreated to the treated portion were killed.

Tests of treated seed showed 99 per cent. germination as compared with 54 per cent. germination of the untreated seed owing to damage by weevils.

Quarantine Proclamation, no. 173.—*Commonw. Australia Gaz.*, no. 107, reprint, 1 p. Melbourne, 6th October 1927.

This proclamation alters a former one prohibiting the importation into Australia of peanut plants [*R.A.E.*, A, xv, 349] to allow for the importation of peanuts for roasting or manufacturing purposes by permission of the Minister for Health and subject to any conditions he may impose.

Pinto da Fonseca (J.). **Um novo coccideo da jaboticabeira,** *Pendularia pendens.* [*P. pendens*, a new Coccid on *Eugenia jaboticaba*.] —*Chacaras e Quint.*, xxxvi, no. 3, pp. 268–269, 1 fig., 5 refs. S. Paulo, 15th September 1927.

Pendularia pendens, gen. et sp. n., is described from *Eugenia jaboticaba* in Brazil. Only females have been found.

Díaz G. (A.) & Zetek (J.). **La hormiga arriera en Panamá y como combatirla.** [The Leaf-cutting Ant of Panama and Means for its Control.]—*Bol. agric.*, i, no. 8 (Dec. 1926), pp. 2–13, 13 pls. Panama, Republic of Panama [August 1927].

There are at least two leaf-cutting ants in Panama, *Atta cephalotes* and *A. sexdens*. They may be controlled by fumigating the nests with carbon bisulphide or Cyanogas calcium cyanide, and full particulars are given for applying the latter by means of pumps.

Wolcott (G. N.). **Entomologie d'Haiti.**—8vo, 440 pp., 133 figs., 7 refs. Port-au-Prince, Haiti, Dept. Agric., 1927.

In this volume, written primarily as a text-book for the students of the Agricultural College of Haiti, the author has collected a good deal of information that has previously appeared in papers of the Insular Experiment Station of Porto Rico and elsewhere. He discusses the relations of insects with plants, animals and other insects and with their inorganic environment, their tropisms and psychology, their relations with man and their control. The classification of insects is explained, and an account is given of the principal pests infesting the various crops and stored products, as well as those attacking domestic animals and man.

RUSSO (G.). **La lucha natural o biologica contra los insectos dañinos á los cultivos.** [The Biological Control of Insects injurious to Crops.]—*Bol. Lab. Ent. Estac. nac. agron. Col. Agric.*, no. 1, 15 pp. Santo Domingo, 1927.

This is a brief discussion of the biological control of insect pests, examples being given of the successful use of parasitic and predacious insects for this purpose in various parts of the world.

RUSSO (G.). **Relación de las enfermedades del cultivo de algodón, papa, berenjena y cebolla en la provincia de Monte Cristy, R.D.** [Report on the Diseases and Pests of Cotton, Potato, Egg-plant and Onion in the Province of Monte Cristy, San Domingo.]—*Lab. Ent. Estac. nac. agron. Col. Agric.*, 13 pp. Santo Domingo, 1927.

The following pests were observed in April 1927 : *Platyedra* (*Pectinophora*) *gossypiella*, Saund., *Dysdercus andreae*, L., and *D. neglectus*, Uhler, on cotton ; *Phthorimaea operculella*, Zell., and *Epitrix parvula*, F., on potato ; *E. parvula* and the Tingid, *Corythaica monacha*, Stål, on egg-plant ; *Epitrix cucumeris*, Harr., on tobacco ; and *Thrips tabaci*, Lind., on onion.

TORRES (I. L.). **El gorgojo del ñame del guineo** (*Cosmopolites sordidus*). [The Banana Borer, *C. sordidus*.]—*Rev. Agric. P. Rico*, xix, no. 2, pp. 56–58, 2 figs. San Juan, P.R., August 1927.

RIVERA (E. M.). **Informe sobre el trabajo de estudios del gorgojo del ñame del banano.** [Report on the Study of the Banana Borer.]—*Op. cit.*, pp. 59–62, 1 fig., 1 map.

The first of these articles gives a brief and popular account of the bionomics of *Cosmopolites sordidus*, Germ., in Porto Rico, with recommendations for its control, while the second records the results of a survey to determine the extent of the infestation by this weevil in the island.

OGILVIE (L.). **Report of the Plant Pathologist for the Year 1926.**—*Rep. Dept. Agric. Bermuda 1926*, pp. 35–41. Hamilton, 1927.

During the year 80 females and 66 males of *Opius humilis*, Silv., the Braconid parasite of the Mediterranean fruit-fly [*Ceratitis capitata*, Wied.] were liberated [*R.A.E.*, A, xv, 177] and twigs bearing mealybugs parasitised by the Encyrtid, *Pseudaphycus utilis*, Timb., imported from Hawaii, were placed in trees infested with *Pseudococcus nipae*, Mask. (sugar-apple mealybug). A few individuals of the Coccinellids *Cryptolaemus montrouzieri*, Muls., and *Scymnus binaevatus*, Muls., imported from California, were also distributed among trees infested with mealybugs.

Comstockiella sabalis, Comst. (palmetto scale), which was abundant on the native palmetto (*Sabal blackburnianum*), was found to be parasitised in one locality, though the parasite was apparently not efficient in controlling it. A parasite imported from Florida was liberated against this scale.

Fungi parasitic on the purple scale [*Lepidosaphes beckii*, Newm.], *viz.*, the red-headed fungus, *Sphaerostilbe aurantiicola* (*coccophila*), the grey-headed fungus, *Podonectria* (*Ophionectria*) *coccicola*, and the black fungus [*Myriangium duriaei*], which was subsequently found to be already present on *L. beckii* in one locality, as well as the red fungus, *Aschersonia* [*aleyrodis*], parasitic on whiteflies [*Dialeurodes*], were imported from Florida and distributed on infested *Citrus* trees throughout the islands.

Diaphania (*Margaronia*) *hyalinata*, L. (melon borer) was kept in check by spraying with lead arsenate, ½ oz. to 1 gal., and by dusting. Some success was secured in combating a severe attack of *Thrips tabaci*, Lind. (onion thrips) with two applications of 40 per cent. nicotine sulphate at the rate of ½ pt. to 50 gals. water with the addition of 2 lb. soap. No satisfactory results were secured with nicotine dust. All control measures against this pest should be put into operation early in order to ensure success. In late May *T. tabaci* is kept in check to a considerable extent by the Anthocorid, *Triphleps insidiosus*, Say.

Wilting of potato plants was caused by the larva of *Phorbia cilicrura*, Rond. (*Pegomyia fusciceps*, Zett.), which bores up and down the stem from the ground level. This larva has been reported from onions in Bermuda, and the author has bred the fly from *Ixia*, *Iris* and seedlings of bean and musk melon. Injury in potato fields is sporadic and cannot be avoided if heavy applications of castor pomace as manure are made after the plants are up, as the flies are attracted to the fermenting material for oviposition. In the case of bulbs in gardens an attack may be checked in the early stages by watering the plants with mercury bichloride, 1–1,000. The larvae do not usually destroy the bulbs, but only the base of the stem, and this is apparently also the case with potato plants. The Noctuid, *Phytometra oo*, Cram., which is destructive to sweet peas early in the year, is also common on many wild and garden plants, but can be easily controlled by the use of arsenicals. Dusting with sulphur gave good results against *Paratetranychus pilosus*, C. & F., on *Zinnia*.

Among the pests intercepted in quarantine were the Coccids, *Vinsonia stellifera*, Westw., and *Diaspis boisduvali*, Sign., on palms from the West Indies.

LYLE (C.). **Cutworms not affected by Seed Treatment.**—*Quart. Bull. Miss. Pl. Bd.*, vii, no. 2, pp. 1–2. A. & M. College, Miss., July 1927.

Experiments were made in Mississippi to determine whether treating maize with turpentine or kerosene before sowing had any effect on attack by cutworms. Larvae of *Agrotis ypsilon*, Rott. (greasy cutworm), *Laphygma frugiperda*, S. & A. (southern grassworm) and *Prodenia ornithogalli*, Guen. (yellow-striped army-worm) were introduced into cold frames when the maize was germinating. Both the materials used proved valueless in preventing cutworm damage. About twice as many plants were destroyed by cutworms on rows treated with kerosene as on untreated rows, and the kerosene apparently caused decreased germination.

LYLE (C.). **Cutworm Bait Poisons.**—*Quart. Bull. Miss. Pl. Bd.*, vii, no. 2, pp. 3–4. A. & M. College, Miss., July 1927.

The author made several small experiments to test the relative value of sodium fluosilicate and Paris green in the bait for cutworms recently recommended [*R.A.E.*, A, xv, 630], and found that, contrary to the experience of other workers, Paris green was in every case the more toxic of the two materials.

A bait consisting of 1 lb. Paris green to 50 lb. wheat bran killed 75 to 80 per cent. of the larvae of *Agrotis ypsilon*, Rott. (greasy cutworm) within 5 to 10 hours and nearly 100 per cent. in 24 hours, while about 90 per cent. of the larvae *Laphygma frugiperda*, S. & A. (southern grassworm) were killed in 24 hours. A sodium fluosilicate bait of the same strength only killed 50 per cent. of the larvae of *L. frugiperda* and 70 per cent. of those of *A. ypsilon* in 24 hours, while 20 per cent. of the former were alive after 72 hours. Larvae of *Prodenia ornithogalli*, Guen. (yellow striped army-worm) were killed about as easily as those of *A. ypsilon*. Tests of these two poisons with cutworms of different ages confirmed the superior killing power of Paris green.

Although no definite conclusions should be drawn from these results, it appears unwise, in view of the very poor results secured against *L. frugiperda*, to advise the general substitution of sodium fluosilicate for Paris green in baits used against this cutworm until more extensive experiments have been conducted.

The Lesser Cornstalk Borer (*Elasmopalpus lignosellus*).—*Quart. Bull. Miss. Pl. Bd.*, vii, no. 2, pp. 2–3. A. & M. College, Miss., July 1927.

Considerable damage was caused in Mississippi in 1921, 1924 and 1927 by *Elasmopalpus lignosellus*, Zell. (lesser corn-stalk borer), the larva of which tunnels in the stalks of maize, beans, cowpeas, *Sorghum*, sugar-cane, peanuts [*Arachis*] and other plants. This Pyralid, which occurs in the southern States and also in Mexico and South America, probably deposits its eggs on the stems of plants or on the ground at their base. The larvae either girdle the stems or burrow into them at, or just below, the surface of the ground, and at the openings of the burrows form tunnels made of excrement and sand fastened together with silk, in which they stay except when feeding. There are about four generations a year in Mississippi, each occupying from five to seven weeks. While one larva usually kills a young bean or cowpea plant in a short time, several may be present in the larger maize plants without killing them, though the injury is serious. Maize appears to be the favourite food-plant, and cowpeas and soy-beans are more likely to be attacked when following maize than after any other crop. The damage seems to be greatest on sandy soils. As *E. lignosellus* hibernates in the pupal stage in the soil, many pupae can be destroyed by clean cultivation and late autumn ploughing, while ditch banks and waste places round the edges of fields should be thoroughly harrowed.

The Florida Plant Act of 1927.—*Mon. Bull. Florida Pl. Bd.*, xii, no. 1, pp. 1–7. Gainesville, Fla., July 1927.

This Act, to prevent the introduction into and spread in Florida of insects and diseases injurious to plants, became effective 19th May

1927, and repeals the Plant Act of 1915. It re-establishes the State Plant Board and defines its powers, which include the authority to prohibit the introduction into the State of any plant, plant product or other thing likely to carry dangerous plant pests or diseases.

Quarantine on Account of the European Corn Borer. Notice of Quarantine no. 43 (5th Revision). Rules and Regulations supplemental to Notice of Quarantine no. 43 (5th Revision).—*U.S. Dept. Agric., Fed. Hortic. Bd.*, S.R.A., no. 90, pp. 26–30. Washington, D.C., May 1927.

This revision, which came into force 1st March 1927, amends and supersedes the previous one [*R.A.E.*, A, xv, 192] and is made to cover new areas infested by *Pyrausta nubilalis*, Hb., including parts of Connecticut and New Jersey. No other material changes are made in the regulations.

European Corn Borer Quarantine. Amendment no. 1 to Rules and Regulations supplemental to Notice of Quarantine no. 43 (5th Revision).—*U.S. Dept. Agric., Fed. Hortic. Bd.*, 2 pp. Washington, D.C., 6th August 1927.

This amendment, which became effective 1st September 1927, alters the conditions under which shelled maize may be sent from within the area infested with *Pyrausta nubilalis*, Hb. (European corn borer) to other States.

Annual Letter of Information, no. 39.—*U.S. Dept. Agric., Fed. Hortic. Bd.*, S.R.A., no. 89 (Suppmt.), 58 pp. Washington, D.C., September 1927.

This is a list of pests intercepted on imported plants and plant products from 1st January to 31st December 1926.

Poole (R. F.) & Schmidt (R.). **The Nematode Disease of Sweet Potatoes.**—*Phytopathology*, xvii, no. 8, pp. 549–554, 2 pls., 1 fig., 5 refs. Lancaster, Pa., August 1927.

Heterodera radicicola, Greeff, causes heavy losses to sweet potatoes in the eastern part of North Carolina, especially on sandy soil, and a number of other crops are recorded as having been seriously attacked in 1926. Various strains of varieties of sweet potatoes showed wide variation in resistance and susceptibility, root-infection of resistant varieties being very slight. Infestation was very noticeable on tubers that were cracked by physiological changes. Varieties susceptible to *Fusarium* wilts are resistant to the Nematode and *vice versa.*

Underhill (G. W.). **Studies on the Potato Tuber Moth during the Winter of 1925-1926.**—*Bull. Virginia Agric. Expt. Sta.*, no. 251, 21 pp., 3 figs. Blacksburg, Va., August 1926. [Recd. September 1927.]

Observations show that the potato tuber moth [*Phthorimaea operculella*, Zell.], which caused serious injury to the autumn potato crop in east Virginia in 1925, survived the following winter out of doors in the pupal stage only, though it was present in all stages in storehouses kept at a temperature above freezing point. The larvae continued to live out of doors until the food-supply was spoiled by frost, after which they either pupated or perished. They could not apparently survive the winter in the pre-pupal stage. The pupae are found either on the surface of the soil attached to plant débris, etc., or just under the surface, the maize-stalks in a field where a spring crop of potatoes has been previously grown also serving as a place of attachment. The cocoons are usually found within a few inches of the food-plant. The mortality in the pupal stage was very heavy, only about 5 per cent. surviving in spring.

No evidence has been obtained to indicate that the larvae that spin cocoons in mid-summer live through the winter, the infestation of the fields where spring crops are grown being easily traceable to rejected potatoes and self-sown plants. The fact that adults emerge on warm days during the winter and early spring, and die before there is food available for the larvae, greatly reduces the number of individuals that live through the winter. The maximum life period of the moth is apparently 60 days.

The smallness of the percentage of pupae surviving until spring is due to the combined effect of the cold and the work of parasites. The following species, all of which are believed to be parasites of *P. operculella*, were taken in the autumn from infested potato foliage and rejected potatoes: *Campoplex ferrugineipes*, Ashm., *C. phthorimaeae*, Cush., *Ephialtes aequalis*, Prov., *Bracon gibbosus*, Say, *Apanteles carpatus*, Say, and *Pimpla* (*Itoplectis*) *conquisitor*, Say. An additional species, *Microbracon gelechiae*, Ashm., was collected during the summer. More individuals of *C. ferrugineipes* were taken than of all the others combined. Parasites of doubtful origin were *Zele melleus*, Cress., and *Anaphes* spp., while two species emerging from cages soon after the material was collected were *Phanurus* sp. and *Polynema striaticorne*, Gir., which are probably egg parasites.

Two predacious bugs, *Podisus maculiventris*, Say (*spinosus*, Dall.) and *Lyctocoris campestris*, F., were seen to kill the larvae, and the ants, *Formica fusca subsericea*, Say, and *Lasius niger americanus*, Emery, were observed attacking live larvae and dragging them into their nests. The parasites appeared to be fairly evenly distributed in all districts, the percentage of parasitism showing a large increase late in the season, when it averaged 30 per cent., as compared with an average of 12·2 per cent. earlier in the autumn.

Since observations showed that far larger numbers of both larvae and pupae are present in fields where an autumn crop is grown than in those used only for spring crops, the author considers that the former are unquestionably a greater source of infestation for the next year's crop.

WAKELAND (C.). **False Wireworms injurious to Dry-farmed Wheat and a Method of combating them.**—*Res. Bull. Idaho Agric. Expt. Sta.*, no. 6, 52 pp., 23 figs., 68 refs. Moscow, Idaho, July 1926. [Recd. September 1927.]

Tenebrionid beetles of the genus *Eleodes* have generally been considered to be of little or no economic importance. In Idaho, at least 11 species and 15 varieties have been observed, a list of which is given. *E. hispilabris*, Say, is the most important and sometimes causes serious damage. The adults hibernate in hedgerows and other sheltered places and emerge in early spring. They are active only when temperatures are moderate, when they crawl long distances. Their feeding causes very little injury. Pairing occurs during May and early June and oviposition shortly after, the eggs being placed in dry soil close to where it joins the moist subsoil. The incubation period lasts about 15 days, the larval stage 370 days and the pupal stage 34. The chief damage is done to dry-farmed wheat by the larvae, which destroy the germ in planted kernels, devour the sprout or gnaw the stem below the surface of the ground. They are entirely subterranean, and are invariably found in grain fields at the juncture of the dry and moist soil if grain seed is at or above the juncture, or below the juncture if no food is available above it.

Natural enemies of these beetles are of comparatively little importance. The Braconid, *Perilitus eleodis*, Vier., is a minor parasite of the adults of *E. hispilabris*, 25 per cent. being the highest degree of parasitism observed, and has also been found attacking *E. extricata*, Say. The most important natural enemy of the latter, however, is the Sarcophagid, *Eleodiphaga caffreyi*, Walt., which is probably partly responsible for the fact that it is only of minor importance, parasitism occurring before the oviposition period. Of 169 individuals collected in one day, 55 per cent. were parasitised. Predators include the Carabids, *Harpalus fraternus*, Lec., *Callisthenes luxatus*, Say, and *Calosoma semilaeve*, Lec., and the Histerid, *Hister ulkei*, Horn. Other enemies are blackbirds, fowls and turkeys, undetermined mites, etc. Poison bait is the most satisfactory remedy [*R.A.E.*, A, xi, 450], and this method should be followed through two seasons over a large area in order to obtain almost complete destruction of the beetles. Cultural practices have proved to be of little direct benefit in controlling *Eleodes* spp., but good farming methods would greatly reduce the numbers by eliminating weeds, ground-squirrel burrows, rubbish, etc., which afford protection to hibernating adults.

WATSON (J. R.). **Citrus Aphids and the Freeze.**—*Florida Gr.*, xxxv, no. 5, p. 5, 1927. (Abstract in *Expt. Sta. Rec.*, lvii, no. 1, p. 60. Washington, D.C., July 1927.)

While the occurrence in Florida of the coldest weather since 1918 probably increased the menace from the citrus aphis [*Aphis pomi*, DeG.], it also provided an unusual opportunity for combating this pest. Observations made the day after a frost by R. L. Miller indicate that the cold did not kill the Aphid, only 6 individuals in 5,000 examined having succumbed. A. N. Tissot found that the eggs of *A. pomi* on pears were hatching in large numbers, this being apparently the first time that the eggs of this Aphid had ever been observed to hatch in Florida.

While the Aphids had not been killed by the cold, the author states that most of them were likely to die of starvation in consequence of the destruction of the young foliage, though enough would survive to cause a heavy spring infestation, provided that climatic conditions were favourable and no control measures were taken. Spraying with oil emulsion is recommended.

MOTE (D. C.) & WILCOX (J.). **The Strawberry Root-weevils and their Control in Oregon.**—*Circ. Oregon Agric. Expt. Sta.*, no. 79, 24 pp., 1 pl., 7 figs., 4 refs. Corvallis, Ore., February 1927. [Recd. September 1927.]

The strawberry root-weevils, *Otiorrhyncus* (*Brachyrrhinus*) *ovatus*, L., *O.* (*B.*) *rugifrons*, Gyll., and *O.* (*B.*) *sulcatus*, F. (black vine weevil), constitute one of the worst menaces to the strawberry industry of Oregon. Heavily infested strawberry beds are destroyed in two or three years or the yield is so reduced that they become unprofitable. Infested fields are characterised by distinct areas of injury, usually circular. This peculiarity may be explained by the fact that the weevils usually crawl into the fields and, being somewhat gregarious, collect in groups, moving outward for oviposition. The distribution of the weevils in Oregon is discussed. They feed on blackberry, raspberry, loganberry and cranberry, as well as many other plants, including grasses. In view of the successful results obtained with apple baits in the control of these weevils in Washington [*R.A.E.*, A, xiv, 271], similar experiments were carried out in Oregon, and additional studies were made on their life-history and habits.

All stages of the three weevils are described. The adults emerge between 1st May and 15th June and feed for about two weeks on strawberry leaves before ovipositing. They are active only at night. The eggs are usually laid singly or in groups of 2–7 in or about the crown of the plant, on the soil or on the dead leaves. *O. ovatus* and *O. sulcatus* lay their eggs chiefly in June and July, while *O. rugifrons* oviposits chiefly in August. The majority of the eggs hatch in 1–3 weeks. The larvae are generally found round the smaller roots of the plant at a depth of 1–10 ins. The larval period lasts till the following spring. A great number of the larvae pass the winter in a practically full-grown state, only feeding in the spring for a short time before pupating in April or May. The pupal stage lasts about 3 weeks. Some of the adult weevils overwinter and lay a few eggs early in the spring.

The method of preparing apple baits is described. Coarsely ground apple pomace, consisting of dried apple peelings and cores, containing 17 per cent. moisture, was used in most of the tests. Since it was found that sprinkling water on the peelings just before grinding enabled them to be ground more rapidly, experiments were made to determine whether the moist bait was as effective as the drier baits, and the following results were obtained: 100 per cent. of the weevils were killed in 67 hours with baits containing 1–5 per cent. moisture, in 37 hours with those containing 10–15 per cent. moisture and in 24 hours with those containing 20–25 per cent. moisture. These results confirmed field tests. Calcium arsenate was found to be the most effective poison, and 5 parts to 95 parts by weight thoroughly covered all the particles of ground apple. The time of application of the bait varies with the species of weevil, the locality and the season. The tests indicate that it should be applied when approximately 75 per cent. of the weevils have reached the adult stage. The number of applications necessary to obtain good control varies with individual conditions. The direct application of between a teaspoonful and a tablespoonful of bait to the crown of each plant proved to be slightly more effective than the broadcasting of the baits along the rows, and only 50-70 lb. of bait to the acre were used, whereas 100 lb. were necessary to obtain a satisfactory control by the second method. A device that enables the bait to be applied through a pipe without stooping is described.

A poisoned bran bait, containing 5 lb. bran, 1 U.S. pt. molasses or 1 lb. sugar, 4 oz. poison and 2 U.S. qts. water, gave 100 per cent. mortality in 12–23 hours in laboratory tests against *O. ovatus* and *O. rugifrons*, using the following poisons : zinc arsenate, calcium arsenate, sodium fluoride, magnesium arsenate and sodium fluosilicate. In field tests bran baits poisoned with sodium fluosilicate and various arsenicals compared somewhat favourably with apple baits, calcium arsenate with 2 U.S. pts. molasses in the bran bait giving a mortality of 91·93 per cent. compared with a mortality of 92·92 for the calcium arsenate apple bait. Experiments with some of these poisons and sodium fluoride used as dusts showed that the percentage of weevils killed 8–14 days after a second application of dust (made 16 days after the first) also compared favourably with some of the bait tests, sodium fluosilicate giving a mortality of 97·55 per cent. and calcium arsenate mixed with an equal quantity of hydrated lime giving 93·6 per cent. Further tests are to be made with this method of control.

Clean cultivation and measures for keeping the plants in vigorous growing condition are of value. After the destruction of the plants, old fields should be ploughed in the autumn and kept free from weeds until the following spring in order to starve the weevils and expose them to adverse weather conditions. If ploughing is done in the summer or after harvest the weevils are driven into the younger plantings where they are more difficult to control.

A fourth species of strawberry root-weevil, *Dyslobus granicollis*, Lec., was discovered in Oregon in 1926. It is also found on hazel, salmonberry [*Rubus spectabilis*] etc., but little is known of its life-history and habits. The adults emerge in August and September and pass the winter in the ground about the roots of the plants.

HASEMAN (L.) & SULLIVAN (K. C.). **Controlling the Epidemic of Apple Worms.**—*Bull. Missouri Agric. Expt. Sta.*, no. 250, 16 pp., 10 figs. Columbia, Mo., April 1927.

During the past two years serious damage has been done to apples in Missouri by the codling moth [*Cydia pomonella*, L.] owing to favourable natural conditions, the occurrence of variations in the life-cycle, and particularly of an increase in the periods during which the adults are emerging, and lack of prompt and thorough spraying. It is suggested that every fruit-grower should have a breeding-cage and keep records of the life-cycle of the moth, as the information thus obtained would be worth many times the labour involved. The importance of controlling the first generation of larvae is pointed out, and an increase of the strength of lead arsenate, 1½ to 2 lb. in 50 U.S. gals. of spray, is recommended for this purpose. A spray schedule should be calculated in accordance with the life-cycle data. Dusting is recommended as supplementary to spraying, and the use of sprays against curculios [*Tachypterellus quadrigibbus*, Say, and *Conotrachelus nenuphar*, Hbst.] and fungi at the same time are discussed. Some suggestions for clean cultivation in the orchard are also given.

ROBINSON (R. H.) & HARTMAN (H.). **A Progress Report on the Removal of Spray Residue from Apples and Pears.**—*Bull. Oregon Agric. Expt. Sta.*, no. 226, 46 pp., 5 figs. Corvallis, Ore., February 1927; summarised in *Better Fruit*, xxi, no. 7, pp. 5–6 & 16. Portland, Ore., January 1927.

The conclusions reached after numerous experiments in dealing with the spray residue on apples and pears are very similar to those arrived at in Washington [*R.A.E.*, A, xv, 602]. It was found that any mechanical process of cleansing tested caused more or less injury to the fruit, either directly or by encouraging the decay or wilting of the fruit when stored. It is thought that the spores of fungous diseases may also be conveyed from one fruit to another by contaminated brushes. Tables are given showing the results of chemical treatment of the fruit. Of the many compounds tested, hydrochloric acid was the most successful in removing not only arsenicals but also any lead, copper or lime residue, and did not cause any injury to the fruit when properly used. Nitric, acetic and sulphuric acid, though promising in some respects, were less effective. Sodium hydroxide is the only basic compound discovered that successfully removes lead arsenate under all conditions, but, when used at ordinary temperatures and at equal concentrations, it is no more effective than hydrochloric acid in the removal of lead arsenate, and proved ineffective in the removal of copper or lime. Its use also resulted in a certain amount of injury to the storage qualities of the fruit. The efficiency of solvents is affected by several factors, such as the length of the treatment, the concentration and temperature of the solution, the maturity of the fruit, the amount of agitation given and the spray programme that has been followed. The possibility of using a disinfectant with the solvents is being investigated. A small amount of moisture left on the fruit after the washing treatment appeared to be harmless, provided that the fruit was free from contamination or decay.

LIGHT (S. S.). **A Weevil Pest of Strawberries,** *Barypithes* (*Exomias*) *araneiformis* **Schrk.** (*brunnipes*, **Ol.**).—*Fruit-Grower*, 22nd September 1927, reprint 2 pp. London, 1927.

A weevil, *Barypithes* (*Exomias*) *araneiformis*, Schrk. (*brunnipes*, Ol.), has for the past few years been very injurious to strawberry plants at Long Ashton. The adults are first seen on the plants towards the end of March and may possibly occur earlier, increasing in numbers until the maximum is reached about the end of April. They attack all parts of the plant above ground, eating holes in the young leaves, leaf-stalks and bud-stems, devouring the growing carpels in the unopened buds and boring out holes in the fruit. This damage continues throughout April, May, and the first half of June. By the end of May the weevils begin to leave the plants for the soil and manure on the beds, where pairing occurs, and by the end of July all have disappeared into the earth, where they lay their eggs in clusters round the roots of the strawberry plants. Larvae were first observed at the beginning of July. They live in the soil, attacking the roots of strawberry, but doing comparatively little damage. About September they pupate in the soil and hibernate there as pupae or adults. There is thus only one generation in a year in England.

Trapping the adults by placing large pieces of damp, moss-covered bark between the rows of plants has been proved successful by previous investigators ; this should be done in June, when the weevils leave the plants for the manure around them. Remedies suggested for other strawberry weevils [*R.A.E.*, A, iv, 189 ; v, 287 ; xiv, 271] could also be used with effect against *B. araneiformis*, and the American plan of protecting strawberry beds, by placing a barrier round them in the form of a board 1 ft. high with a strip of tanglefoot at the top on the outside, is also recommended. The eggs and larvae in the soil might be treated with a soil insecticide ; paradichlorobenzene has been tried, but it is unlikely that this substance could be used in sufficiently small proportions to provide an economic remedy. Calcium cyanide might be more useful.

PALMER (E. F.) & VAN HAARLEM (J. R.). **The Grape in Ontario.**—*Bull. Ont. Dept. Agric.*, no. 328, 52 pp., 27 figs. Toronto, June 1927.

The section of this paper dealing with insects attacking grapes in Ontario, by L. Caesar, which is a revision of a previous one [*R.A.E.*, A, iv, 404], contains details of the life-history and control of the grape leafhoppers, *Erythroneura comes*, Say, *E. tricincta*, Fitch, and *E. vulnerata*, Fitch ; *Haltica* (*Altica*) *chalybea*, Ill. (grape-vine flea-beetle) ; *Macrodactylus subspinosus*, F. (rose chafer) ; and *Polychrosis viteana*, Clem. (grape-berry moth).

The leafhoppers, which are dealt with collectively, pass the winter in the adult stage, and, in Ontario, begin to oviposit about the end of June. The eggs begin hatching about the middle of June and almost all have hatched by the middle of July, when the oldest nymphs begin to transform into adults, which oviposit and produce a partial second generation. Only individuals that have reached the adult stage at the onset of the cold weather hibernate, the remaining nymphs perishing. Spraying about a week after the fruit has set with $\frac{3}{8}$ pt. nicotine sulphate to 40 gals. Bordeaux mixture, 4 : 8 : 40, will kill both the eggs and the nymphs if applied to the lower surfaces of the leaves, and adequate control can usually be secured with a single treatment.

H. chalybea, though sometimes very destructive, is not common in Ontario, where the adults alone cause serious damage, attacking the buds in the spring when they come out of hibernation. They lay their eggs under the loose bark of the vine or under the bud scales, the larvae that hatch from them feeding upon the leaves without doing much damage. The larvae become mature early in July when they enter the ground and pupate, the adults emerging about two weeks later to feed on the foliage until they go into hibernation in the early autumn. Spraying new growth with 3 lb. lead arsenate and 1 gal. molasses to 40 gals. water when the beetles appear in the spring, and repeating the application if necessary 3 or 4 days later, is recommended as a preventive measure in vineyards known to have been previously attacked, and the larvae may be killed when they appear on the foliage by spraying with $1\frac{1}{2}$ lb. lead arsenate to 40 gals. water. On bright days the beetles may be knocked from the buds into small frames made of muslin and saturated with kerosene.

Additional information in regard to *M. subspinosus* and *P. viteana* has already been noticed from other sources [*R.A.E.*, A, xiii, 577; xv, 32].

DUTTON (W. C.). **Some Effects of Spraying Materials on Fruit and Fruit Trees.**—*58th Rep. Fruit Gr. Ass. Ont. 1926*, pp. 39–49. Toronto, 1927.

The information contained in this paper on the effect of oil sprays on the breaking of the rest period and on the bud development of pear and peach trees in Michigan has already been noticed from another source [*R.A.E.*, A, xv, 605].

The application of oil sprays to certain fruit trees in California, while without effect when made in early spring, was observed to advance the blossom and stimulate the leaf growth when effected in late spring, while if the treatment is delayed beyond a certain point the blossom will be retarded. The advance or delay in the blossoming period seems to be followed by a corresponding change in the ripening date. There is evidence to show that heavy applications of oil sprays may affect the amount of water given off and the formation of sugars and similar materials in the leaf, the fruit being also liable to be affected directly or indirectly by such applications. Tests carried out in 1922 and 1923 on sour cherries with lime-sulphur and Bordeaux sprays and dusts of sulphur and of copper sulphate and lime showed that Bordeaux mixture caused very serious dwarfing of the fruit. This influence is most severe in dry seasons, probably owing to excessive loss of water from the leaves of the trees sprayed with Bordeaux mixture.

Excessive applications of lime-sulphur to apples in Michigan have in some instances caused a severe drop of fruit, though normal applications have had no apparent immediate effect on the fruit set. There is, however, evidence to show that lime-sulphur may have a cumulative effect on the formation of fruit-buds and consequently lower production.

In the discussion that followed, E. F. Palmer stated that 98 per cent. dead buds were found on peach trees sprayed the previous autumn with lime-sulphur, while only 35 per cent. were dead on unsprayed trees after a period of severe cold; he concluded that spraying with lime-sulphur reduced the resistance of the buds to cold.

DODD (A. P.). **The Biological Control of Prickly Pear.**—*J. Council Sci. Ind. Res.*, i, no. 1, pp. 48–54, 4 pls. Melbourne, August 1927.

This general account of the investigations of the Commonwealth Prickly Pear Board is largely taken from other sources, which have been already noticed in this *Review*. The insects and mites mentioned as attacking prickly pear (*Opuntia* spp.) include the Lamiid, *Moneilema ulkei*, Horn, which is now being successfully bred and appears to be established in the field; the Coccid, *Dactylopius newsteadi*, Ckll., which has been established and is very destructive to *Opuntia imbricata*; the Cecidomyiid, *Asphondylia opuntiae*, Felt, which frequently destroys 75–100 per cent. of the fruits in North America, but which has not yet been acclimatised in Australia; and *Tetranychus opuntiae*, Banks (prickly pear red-spider), which has spread widely and infested many thousands of acres of prickly pear. The larvae of this mite, which was imported from Texas in 1924, feed on the surface of the pear, causing the formation of a corky layer the growth of which brings about the destruction of the joint.

The Pyralid, *Melitara prodenialis*, Wlk., from Florida, which lives in colonies within the joints and has three generations a year, was acclimatised in 1923 and has been destructive to *Opuntia stricta* in Queensland. Three other species of *Melitara, M. bolli*, Zell., *M. doddalis*, Dyar, and *M. dentata*, Grote, occur in the more arid regions of the United States, each possessing one generation annually and causing considerable damage to prickly pears, but have not yet been established in Australia. Another Pyralid that lives in colonies within the joints, *Laniifera cyclades*, Druce, is now being studied with a view to introducing it from Mexico.

[Vukasović] Voukassovitch (P.). **La lutte pour la possession de l'hôte chez les larves de Chalcidides (ectoparasites solitaires).**—*Bull. biol. Fr. Belg.*, lxi, no. 3, pp. 315–325, 2 figs., 7 refs. Paris, 1927.

The following observations were made in the course of laboratory studies in Serbia. The females of *Habrocytus* sp. oviposit on the larvae of Braconids such as *Apanteles* spp., within their cocoons. The eggs hatch in 2–4 days, and the larvae at once move actively about on their host for several hours, feeding at intervals, before becoming fixed. During this active period they kill, apparently by injecting poison, all other eggs and larvae either of their own or of other species that they encounter.

Habrocytus bedeguaris, Thoms., and *Torymus macropterus*, Wlk., oviposited on larvae of *Rhodites rosae*, L., and *Oligosthenus stigma*, F., and also on larvae of their own species, in galls of *R. rosae*, the parasite in every case killing the host larva at the moment of oviposition and laying only one egg, but returning several times to lay another in the same host, using the original oviposition puncture. The larvae, on hatching, behave in exactly the same way as those of the other species of *Habrocytus*. The behaviour of these larvae is only a special instance of the habit of killing other individuals of the same species that is usual among solitary parasites, and is beneficial to the species.

Truelle (A.). **La destruction de la carpocapse des noix.**—*Vie agric. rur.*, xxxi, no. 38, pp. 184–186. Paris, 18th September 1927.

Three species of Tortricids known to attack nuts in France are *Cydia* (*Carpocapsa*) *pomonella*, L., *C.* (*C.*) *putaminana*, Stgr., and *C.* (*C.*) *splendana*, Hb., only the first-named being of any importance. Hitherto, the remedy most generally adopted has been the collection and burning of infested nuts that have dropped prematurely. The degree of infestation varies greatly on different trees and on different soils, but is apparently worst in dry regions. The remedies that have proved most efficacious both in France and the United States are quoted from various authors. The trunks and branches of the trees should be cleared of all moss or lichen that might serve to shelter the pupae, and the trees should be banded to catch pupating individuals. Collection of infested nuts is still considered the most effective measure, provided that they are collected as soon as they fall (for the larvae leave them almost as soon as they reach the ground) and that this measure is practised co-operatively. The soil below the trees should then be turned over to bury the larvae. Besides arsenical treatment [*R.A.E.*, A, xiv, 407], disinfection of the soil should be practised as soon as the crop is gathered, using 1½ to 1⅜ oz. carbon bisulphide to the square yard in furrows about 1½ inches deep, which are then covered over.

STOYE (O.). **Schädlinge und Nützlinge in der Kakteenzucht.** [Enemies and Friends in the growing of Cactus.]—*Z. Sukkulentenk.*, iii, no. 5–6, pp. 101–105. Berlin, 1st October 1927.

The most important insect pests in cactus seed-beds are ants, red spiders and Coccids. Dusting the beds with unslaked lime and pouring hot water into their nests is useful against ants. Against red spider the boxes should be kept well aired and should be sprayed with a 2 per cent. cresol-soap-petroleum emulsion, and afterwards with clean water. The Coccids should be removed with a brush, and the plants should then be well sponged.

BAUMANN (C.). **Beobachtungen über die Metamorphose der Schlupfwespen** *Coleocentrus excitator* **Poda und** *Ephialtes manifestator* **L.** [Observations on the Metamorphosis of *C. excitator* and *E. manifestator.*]—*Z. Morph. Oekól. Tiere*, ix, no. 1–2, pp. 313–332, 9 figs., 10 refs. Berlin, 1st October 1927.

This paper deals in detail with the moulting of the early stages of these Ichneumonids. In Germany the larvae of *Ephialtes manifestator*, L., live in the pupae of *Spondylis buprestoides*, L., in stumps of pine, and those of *Coleocentrus excitator*, Poda, in another Cerambycid, probably *Leptura rubra*, L., also in pine stumps.

ZELLER (S. M.). **Dwarf of Blackberries.**—*Phytopathology*, xvii, no. 9, pp. 629–648, 12 figs., 8 refs. Lancaster, Pa., September 1927.

The disease known as "dwarf," which is apparently distinct from other virus diseases of *Rubus*, affects blackberries, on which it is almost confined to one variety, and loganberries in California, Oregon and Washington; the affected plants are rendered valueless. In Oregon the author succeeded in infecting healthy loganberries by transferring to them Aphids from a mixed colony of *Capitophorus tetrarhodus*, Wlk., and *Macrosiphum dirhodum*, Wlk., originally taken from sweet briar (*Rosa rubiginosa*), that had fed on an infected loganberry plant. Aphids of the same colony fed on healthy loganberry plants and transferred to other healthy plants under the same conditions did not produce the disease. Subsequently the disease was produced in healthy loganberries by transferring *C. tetrarhodus* to them from diseased plants. Experiments in transmission of the disease by *Oecanthus niveus*, DeG., and by leafhoppers, probably *Typhlocyba* (*Empoa*) *rosae*, L., gave negative results, as did also the injection into healthy plants of juice expressed from macerated diseased leaves and buds from diseased plants grafted into healthy ones.

Fatty Acid Compounds of Cinchona Alkaloids for moth-proofing Clothes.—*Pharm. J.*, cxix, no. 3343, pp. 580–581. London, 26th November 1927.

Of all the chemicals and mixtures of chemicals studied in attempts to discover a non-toxic, non-offensive and non-apparent moth-proofing for clothes, only cinchona alkaloids and their derivatives have constantly passed all the required tests. Fatty acid salts of these alkaloids are, unlike the alkaloids themselves, soluble in petroleum naphtha, and it was found that articles treated with this solution were free from infestation when examined a year later. Four thousand gallons of the solution is sufficient to treat 160 lb. of wool, feathers, or fur.

Patterson (J. E.). **The Relation of Highway Slash to Infestations by the Western Pine Beetle in Standing Timber.**—*Tech. Bull. U.S. Dept. Agric.*, no. 3, 9 pp., 3 figs. Washington, D.C., June 1927.

A study, covering a period of four years, has been made in southern Oregon to determine the effect of the presence of line slash, that is, the rubbish left after constructing roads, telephone lines, etc., on the degree of infestation of stands of western yellow pine (*Pinus ponderosa*) by the western pine beetle, *Dendroctonus brevicomis*, Lec. The débris in the case in question consisted of the entire trunks and tops of felled trees, dragged to either side of a strip 60 feet wide and 24 miles long, and left, generally in the form of single logs placed separately along the edges of the clearing. Other bark-beetles found infesting these logs were *D. monticolae*, Hopk., *Ips emarginatus*, Lec., and *I. confusus*, Lec., but only *D. brevicomis* occurred in sufficient numbers to warrant study. It was found that the attacks of the beetle in each square foot of the felled logs numbered rather less than half of those in a similar area in the standing trees. There is abnormal mortality among the generations developing there ; the increase of beetles developing in the débris was only 64 per cent. of those making the attack, whereas in the standing trees the corresponding increase was 135 per cent. Bark-beetles concentrate on fresh débris and for a time increase the degree of infestation on standing trees in the immediate vicinity, but this concentration is not permanent and normal distribution of infestation is resumed within a year.

McGregor (E. A.). *Lygus elisus* : **A Pest of the Cotton Regions of Arizona and California.**—*Tech. Bull. U.S. Dept. Agric.*, no. 4, 14 pp., 7 figs., 1 ref. Washington, D.C., July 1927.

Recent investigations have established the fact that *Lygus elisus*, Van Duzee (tarnished bug), which has for some time past been known to attack various plants, is perhaps the most serious pest of cotton on the Pacific Coast. It readily passes from its wild food-plants, one of the commonest of which is *Chenopodium*, to cultivated ones. It occurs in all the cotton-growing areas of the Pacific region and in Arizona. In 1917 this bug became conspicuous on cotton about 2nd August and the attack lasted about four weeks, whereas in 1918, when the average infestation was computed at 15 per cent. of the squares, blooms and young bolls and the damage to the cotton crop in the Imperial Valley, California, was estimated at £256,000, or 8 per cent. of the total value, the bug was abundant by 15th July and the attack was acute for 5 weeks and extended over 7 weeks. In both years the bug was first observed on cotton about 12th June.

In the Imperial Valley, where *L. elisus* was chiefly studied, lucerne is even more extensively attacked than cotton, though the injury to it is less severe. The attack on lucerne is distributed over all parts of the foliage, while on cotton it is confined to the squares, blooms and young bolls, and almost all that are punctured are shed. Since the actual mechanical injury associated with the feeding is slight compared with the resulting damage, it is suspected that either a toxic material or an organism may be introduced into the plant tissues at the time of feeding, and other evidence supports this supposition.

Data on the life-history are meagre owing to the difficulty experienced in rearing the bug in confinement, but in the Imperial Valley development begins early in the spring, and all stages may be found throughout the growing season on numerous succulent plants. On cotton the eggs are usually laid on the squares, either in the folds of the floral parts or in special punctures. Hatching requires 4 days under summer conditions, and the bugs become adult in about 20 days. Lucerne is attacked during the greater part of the growing season, but the attack on cotton is limited to the period from early June to late September, there being probably a maximum of 7 generations on lucerne as compared with about 4 on cotton. It seems probable that the winter is passed chiefly, if not entirely, in the adult stage. A description of the adult is given.

As the mean temperature for the entire period during which *L. elisus* occurred on cotton in the summer of 1918 was 89° F., while for the 3 weeks previous to its appearance it was 86° F., the factor that prevents infestation of cotton up to the middle of June is probably not climatic. The date of appearance of the bug on cotton may be accounted for by the fact that it does not feed on cotton foliage, and the formation of squares does not usually take place until about mid-June. It is very abundant on lucerne for some time previous to its appearance on cotton, but fails to migrate to the latter until the budding season. Climatic conditions also fail to account for the abrupt reduction in the numbers of the bug that occurs annually about the end of August, the temperature remaining almost unchanged until the end of September.

The preference of *L. elisus* for lucerne was established by captures made on growing cotton and lucerne previous to 1st October in 1918, when an average of 70·8 individuals was taken from lucerne and only 5·6 from cotton to 100 sweeps of the net. Under ordinary conditions there appear to be eleven times as many individuals to a given area on lucerne as on cotton. Infested lucerne growing in the neighbourhood of cotton is a common source of severe attacks on the latter crop, which may arise either from the drying of the lucerne owing to water shortage, or from the cutting of this crop for hay. Migrations of this nature were observed after lucerne had been cut on 20th June, 1st August and 19th September 1918.

Reduviids have been seen attacking *Lygus*, and spiders also destroy a considerable number, while individuals of this genus have been found in the stomachs of 26 species of birds, of which swifts and nighthawks appear to be the most important.

Morrill advised that cotton should not be planted in fields adjoining lucerne [*R.A.E.*, A, vii, 206], but the author considers that this might be advantageous if a satisfactory method of controlling the pest on lucerne were discovered. At the season when *L. elisus* becomes dangerous to cotton the plants are often at such a height as to preclude the safe employment of a large vehicle for distributing insecticides, while such an apparatus could be used at any time on lucerne, which might thus be made to serve as a trap crop. In several tests with finely divided sulphur a single application to lucerne or cotton at the rate of 6 or 10 lb. to the acre caused a considerable reduction in the numbers. If later trials with modern cotton-dusting machinery should demonstrate the economy of treating tall cotton, the practice of growing lucerne as a trap crop could be abandoned.

Individuals of *L. elisus* confined under laboratory conditions in screen cages from 12 to 24 ins. above the ground over sulphur dust liberally applied to the surface of the soil at temperatures of 102–116° F. were killed in not more than 30 minutes, while individuals similarly confined over areas free from sulphur suffered no mortality. Both adults and nymphs were killed in 3–5 minutes when exposed to a soil temperature of 125–128° F. in the absence of sulphur. If sulphur were applied under field conditions, the immature stages would be quickly killed when the crops were not too high, whereas the winged adults would for the most part escape.

A device, consisting of a rectangular chamber 6 ft. long by 4ft. 8 ins. high mounted on two large wheels, has been designed to be drawn along the cotton row, subjecting the foliage by means of wooden combs to an agitation which causes the bugs to hop or fly off into the enclosing chamber at the base of which are troughs about half full of crude oil into which they fall.

Experiments with light-traps, using 35 traps to 8 acres, showed that adults of *Lygus* were somewhat freely attracted to them, but several predators, including a large Reduviid, were also captured in large numbers in oil-coated pans placed under the lights. *L. elisus* was relatively the insect most largely represented in the traps, and the test gives some promise that light-traps may be used to advantage as a supplementary measure in its control.

Cook (O. F.) & Doyle (C. B.). **Sea Island and Meade Cotton in the Southeastern States.**—*Dept. Circ. U.S. Dept. Agric.*, no. 414, 19 pp., 1 fig., 7 refs. Washington, D.C., May 1927.

Though early in the season sea island cotton affords less opportunity than upland cotton for the breeding of boll weevils [*Anthonomus grandis*, Boh.], in the later stages of development the former variety is the more susceptible of the two to injury, owing to the thinner walls and softer texture of its bolls. Experiments have shown that heavily fruited plants of sea-island cotton may have the crop completely destroyed by weevils in a few days of wet weather, while adjacent plantings of upland cotton showed much less damage to the bolls.

In consequence of the necessity of making the tests with the two varieties of cotton growing side by side and the impossibility of protecting the sea island cotton (which requires a longer season to mature a full crop) from weevils that may breed on the upland cotton, it is difficult to determine the greater extent of damage to sea island cotton.

Control by means of poisons is not practicable in the wet weather that often prevails in the coast districts at the critical stage of the fruiting season, and precautionary measures are only of value where there is whole-hearted co-operation on the part of the growers. The author suggests that weevil injury might be avoided by planting cotton only in alternate years in isolated districts where one variety is grown exclusively, since the weevils do not breed on other plants and could not multiply if no cotton were planted in the intervening years. The importance of the established restrictions on the import of cotton seed is emphasised.

REEVES (G. I.). **The Control of the Alfalfa Weevil.**—*Frmrs.' Bull. U.S. Dept. Agric.*, no. 1528, 22 pp., 15 figs. Washington, D.C., June 1927.

The alfalfa weevil, *Hypera variabilis*, Hbst. (*Phytonomus posticus*, Gyll.), which was first recorded from Utah in 1905, has spread steadily over many States, and is still increasing its range at the rate of from 10 to 20 miles a year. The life-history and habits are described [*R.A.E.*, A, xiv, 578]. Although not damaging any crop other than lucerne, the weevil can live on a large number of plants of the clover family and in this way is able to spread from one lucerne field to another many miles away. Although stringent quarantine measures have been passed to prevent its spread, the weevil continues to be disseminated, chiefly by unaided crawling and flight. The imported parasite, *Bathyplectes curculionis*, Thoms., is now considered to kill as many as 90 per cent. of the larvae in many localities. The most suitable apparatus for the application of calcium arsenate sprays is fully described, and with the 10-nozzle outfit recommended 30 acres can be covered in a day, with a spray of 2 lb. calcium arsenate powder (fine enough to pass a 200-mesh screen) to 100 U.S. gals. water. With this method there is no danger of poisoning livestock. Calcium arsenate has been successfully applied in dust form by means of a traction-driven or power-driven fan, or by aeroplane, but greater uniformity of results is desired before these methods can be definitely recommended. Accessory means of control, such as using the first crop as pasture, and steaming, burning and brush-dragging the stubble, might prove useful, but are expensive and interfere with general farm practices.

DYAR (H. G.) & HEINRICH (C.). **The American Moths of the Genus *Diatraea* and Allies.**—*Proc. U.S. Nat. Mus.*, lxxi, art. 19, pp. 1–48, 20 pls. Washington, D.C., 1927.

This revision of the genus *Diatraea* and its allies deals with 10 genera and 26 species, of which 5 genera and 12 species are described as new. The following, the larvae of which attack plants of economic importance, are included: *Diatraea saccharalis*, F., on sugar-cane, maize and various grasses throughout tropical America from the Gulf Coast of the United States to Mexico and Argentina, including the Antilles; *D. magnifactella*, Dyar, on sugar-cane in Mexico; *D. zeacolella*, Dyar, on maize and *Tripsacum* in Virginia, North Carolina, Florida and Kansas; *D. canella*, Hmps., on sugar-cane in the Guianas, Trinidad and Grenada; *D. lineolata*, Wlk., on maize in

Mexico, Costa Rica, Guatemala, Panama, Colombia, the Guianas, Cuba and the Bahamas; and *D. grandiosella*, Dyar, on maize in Arizona, Texas, New Mexico and Mexico.

Diatraea crambidoides, Grote, has been treated as a synonym of *D. saccharalis*, but it is thought that it will prove to be identical with *D. zeacolella.*

Boyden (B. L.). U.S. Bur. Ent. **Sweet Potato Weevil Eradication in Florida and Georgia.**—*Mon. Bull. Florida Pl. Bd.*, xii, no. 2, pp. 17–55, 6 figs. Gainesville, Fla., August 1927.

Most of the information contained in this paper on the measures carried out against *Cylas formicarius*, F., in Florida and Georgia since 1919 is the same as in papers previously noticed [*R.A.E.*, A, x, 281, 439].

As the result of life-history studies carried out from 1925 to 1927, further data are given in regard to the length of the stages. In addition to the sweet potato [*Ipomoea batatas*], *C. formicarius* has been reported as feeding on a number of other plants, the favourite wild food-plant in Florida being *Ipomoea pes-caprae.* In laboratory experiments the weevil fed readily upon *Bidens leucantha* (Spanish needle). In the north-eastern area of infestation the only wild species of *Ipomoea* found was *I. pandurata.* Though this species is a known food-plant and the weevil feeds impartially on it and on sweet potato in the laboratory, it has never been found infested in this area though present on infested farms. The author believes that the entire coast of Florida, wherever *I. pes-caprae* grows, will become infested before long, and this plant appears to grow well inland also. Wherever the situation is not complicated by the presence of a considerable quantity of the wild food-plant, the eradication experiments show that the elimination of the weevil in local infestations is feasible, subject to co-operation on the part of the growers.

Friend (R. B.). **The Biology of the Birch Leaf Skeletonizer,** *Bucculatrix canadensisella*, **Chambers.**—*Bull. Conn. Agric. Expt. Sta.*, no. 288, pp. 393–486, 2 pls., 29 figs., 3 pp. refs. New Haven, Conn., June 1927.

In this detailed account of *Bucculatrix canadensisella*, Chamb. (birch leaf skeletoniser) the author discusses the history and systematic position of both genus and species, and describes the technique of a number of observations made in the laboratory, as the result of which morphological descriptions, confined to the external appearance of the various stages and certain important anatomical details of the exoskeleton, are given.

The account of the life-history of *B. canadensisella* corresponds in the main with a brief account already noticed [*R.A.E.*, A, xv, 40]. The author states, however, that the mining period of the larval stage, estimated by Hutchings at from 7 to 8 days in Ontario, averages in Connecticut from 24 to 31 days, the period of external feeding that follows it occupying two instars and lasting from 13 to 15 days. The total larval life thus averages from 38 to 46 days. The eggs are laid, probably at night, on either surface of the leaf, but the larvae always mine with their dorsal surface towards the dorsal surface of the leaf, and emerge from the mines through the epidermis of the ventral surface. There are five larval instars. The cocoon is spun beneath débris on the ground, and hibernation occurs in the pupal stage. The last larvae were found in the latter part of September.

With the possible exception of the alder, *Alnus incana*, the larvae of *B. canadensisella* feed only on trees of the genus *Betula*, its principal food-plants being *B. populifera* (grey birch), *B. papyrifera* (paper birch), *B. lutea* (yellow birch), *B. lenta* (black birch), and *B. alba* (European white birch), the first four being native trees. *B. lenta* is less frequently attacked than the others, and *B. alba* appears to be a favourite food-plant in Canada. *B. nigra* (river birch) has not been recorded as being attacked, possibly owing to the fact that it is not a common tree in the northern United States and southern Canada.

In the laboratory larvae were induced to eat leaves of *Alnus*, but failed to maintain themselves on them. Attempts to induce females to oviposit on *Alnus* in captivity failed. Alder and oak leaves were eaten more readily when they had been dipped in a distillate from an aqueous extract of birch leaves, but the larvae failed to show any growth on them except in one instance. Under laboratory conditions larvae from *Betula populifera* fed readily and matured on leaves of *B. papyrifera* or *B. lenta*, as did those from *B. papyrifera* on leaves of *B. populifera*.

The various factors affecting the abundance of *B. canadensisella*, classified according to food supply, climate and natural enemies, are discussed. It could probably never eliminate its food-plant in any given region. Although the larvae frequently eat all the foliage on trees over a considerable area, birches are not killed even by several attacks in successive years, as the feeding takes place at the end of August and in September, when the trees have passed through their most active season and are less sensitive to injury. Climatic variations alone are not considered responsible for the more or less regular rise and fall in the abundance of this moth, and this is probably due more to natural enemies than to any other one factor.

Hymenopterous parasites that have been reared from *B. canadensisella*, include the Braconid, *Bucculatriplex secundus*, Vier., the Chalcid, *Haltichella xanticles*, Walk., the Ichneumonids, *Gelis urbanus*, Brues, *Mesochorus* sp., and *Hemiteles* sp., which is probably a hyperparasite, and the Eulophid, *Pleurotropis bucculatricis*, Gahan, from pupae ; and the Eulophids, *Cirrospilus ocellatus*, Gir., from external feeding larvae, and *Closterocerus cinctipennis*, Ashm., and *Derostenus* sp. from mining larvae. The various species of ants and other predacious insects that capture the larvae when they descend to the ground to pupate are more important enemies than any of these parasites and perhaps than all of them combined. In 1925 ants destroyed the entire stock of larvae in the insectary, and on another occasion the examination of cocoons in litter under a birch that had borne hundreds of larvae revealed not more than 25 of them intact. Certain birds have also been observed apparently feeding extensively on the larvae.

The geographical distribution of *B. canadensisella* and of its food-plants in North America is discussed. In Canada the moth has been found from British Columbia to New Brunswick and in the United States as far west as Minnesota and as far south as North Carolina, but it is commonest in the region around the Great Lakes and between them and the Atlantic.

Spraying with lead arsenate, at the rate of 3 lb. powder to 100 U.S. gals. water, about the middle of August, will protect the trees against injury by the larvae. The addition of 1 lb. casein lime will help the spray to spread and make it adhere to the foliage.

Poos (F. W.). **A New Pest of Spinach in Virginia. Preliminary Report.**—*Bull. Virginia Truck Expt. Sta.*, no. 56, pp. 491–497, 1 fig. Norfolk, Va., July 1926. [Recd. Sept. 1927.]

This report on the Pyralid, *Hymenia fascialis*, Cram. (Hawaiian beet webworm), which for the first time attacked the autumn crop of spinach (*Spinacia oleracea*) in Virginia in large numbers in 1926, only deals with the latter part of the season. Although not previously reported as attacking spinach, *H. fascialis* is well known as a pest of beet and occurs on various other plants, particularly Chenopodiaceae and Amaranthaceae. It is apparently of subtropical origin, and has been reported from practically all the temperate and subtropical regions of both hemispheres. A brief description of all stages of the insect is given.

The adults were abundant in the field in October in Virginia, where severe damage was caused to early-planted spinach. All stages of the moth seeemed to be present in great numbers but disappeared rapidly on the approach of cold weather and frosts, until by 18th November no living specimens could be found, partly owing to the fact that most of the spinach had been removed from the fields, in which another crop was immediately planted.

The young larvae feed on the lower surface of the leaves of spinach, which they skeletonise, the more mature ones eating the whole leaves. The plants are weakened and rendered unmarketable, and even killed outright where infestation is severe. As cold weather approaches, the larvae tend to feed more in the heart of the plant, where they spin webs. Numerous plants contained as many as 18 larvae each, the average being about 6 ; about 50 per cent. of the larvae appeared to spin webs.

Observations in Virginia indicated that natural enemies did not reduce the numbers of this moth to any extent. The following Hymenopterous parasites, apparently not previously reported from this host, were reared from it on spinach : *Apanteles marginiventris*, Cress., *Eupteromalus viridescens*, Walsh, and *Sagaritis provancheri*, D.T. The Carabid beetle, *Calosoma calidum*, F., was occasionally observed attacking the larvae. Owing, apparently, to the habit of the young larvae of feeding on the lower surface of the leaves without eating the upper surface, preliminary tests for control with arsenical sprays and dusts gave negative results. Observations on the date of planting during 1926 indicated that spinach should not be planted before 1st September in Virginia, as later plantings appear to escape injury even in fields adjoining those that had suffered severe losses. Infested weeds belonging to the Amaranthaceae or Chenopodiaceae should be destroyed promptly.

[Paddock (F. B.).] **Control of Bee Diseases and Pests.**—*Ext. Serv. Bull. Iowa Coll. Agric.*, no. 138, 16 pp., 5 figs. Ames, Iowa, July 1926. [Recd. September 1927.]

An account is given of the diseases that attack bees, both in the adult and brood stages. Insects attacking the hives include the bee louse [*Braula coeca*, Nitz.], the greater bee moth [*Galleria mellonella*, L.], the lesser bee moth [*Achroia grisella*, F.] and several species of ant. Mice frequently cause great damage to the hives. Recommendations are given for general sanitation in bee hives and their surroundings, and the foulbrood law of Iowa, which authorises inspection of hives that are suspected of harbouring disease and the destruction of diseased colonies, is cited.

THOMAS (W. A.). U.S. Bur. Ent. **The Control of the Porto Rican Mole-cricket, or Changa, on Golf Courses.**—*Bull. U.S. Golf Assoc. Green Sect.*, vi, no. 9, pp. 197–200, 2 figs. Washington, D.C., September 1926.

Scapteriscus vicinus, Scud. (Porto Rican mole-cricket), which is a native of the West Indies and South America and has been known to occur in the south-eastern United States for more than 20 years, has recently become a serious pest of grass on golf courses in the coastal region from Alabama to North Carolina. Though the spread of this insect inland is less rapid than along the coast, the infested area extends in some cases for more than 100 miles from the sea. *S. vicinus* is briefly described, and a short account of its life-history and habits is given [*R.A.E.*, A, xiv, 67]. A map is given showing the distribution of *S. vicinus*, *S. abbreviatus*, Scud., and *S. acletus*, Rehn & Hebard, in the United States in 1925.

Experiments in the control of this cricket with various materials gave satisfactory results in the case of carbon bisulphide, calcium cyanide, and a poison bait consisting of cotton-seed meal, rice flour, calcium arsenate and molasses. One part of a 75 per cent. commercial carbon bisulphide emulsion mixed with 400 parts of water, sprinkled over a green at the rate of 2 U.S. qts. to the square foot, gave over 95 per cent. control for about one month, after which reinfestation began. Applications should be made late in the afternoon when the air is still and the humidity high, and sprinkling with water 20 minutes before the emulsion is applied aids penetration. The cost of this treatment is about £2 for one application to a green, including labour.

A mixture of 30 lb. of a 40 per cent. commercial calcium cyanide dust and 500 U.S. gals. water poured evenly over the entire green with a ¾-inch hose was sufficient to cover about 4,400 sq. ft. and secured rather more than 95 per cent. control, though the effect did not last more than a month. This treatment must be followed by sprinkling to avoid scorching the grass. It is less expensive than carbon bisulphide, costing approximately £1 10s. for one application, including materials and labour.

Three applications of the poison bait, the formula for which has already been noticed [*loc. cit.*], at the rate of 150 lb. to the acre, made at intervals of a week or ten days, gave excellent control. Although the effect was not so immediate as in the case of the other materials, the low cost and ease of application made it possible to treat adjacent infested fairways also, thus preventing early reinfestation. The cost of three applications to one green was about 10s. Treatment with poison bait, which should be applied on the day on which it is prepared, should be repeated at periods of a month or six weeks on badly infested courses, no injury resulting to the greens from immediate use after treatment as is the case with the other two materials.

La lutte contre les parasites des végétaux.—*Rev. agric. égypt.*, no. spéc. Expos. gén. agric., Mars 1926, pp. 32–36. Cairo, 1927.

The organisation of the plant protection service in Egypt is outlined. The hibiscus mealybug [*Phenacoccus hirsutus*, Green] is a pest on many trees, shrubs and plants, including cotton, and causes the death of heavily infested ones, guava being particularly attacked. The most severely damaged and the most susceptible plants should be removed, and the more healthy ones sprayed with oil emulsion. The introduction of a Coccinellid [*Cryptolaemus montrouzieri*, Muls.] from France to control *P. hirsutus* has been previously described [*R.A.E.*, A, xiv, 572]. All cotton ginneries in Egypt are now required to be fitted with the necessary plant for heating the seed to 140° F. as a remedy for infestation with the pink bollworm [*Platyedra gossypiella*, Saund.]. Some 700,000 *Citrus* trees are fumigated each year with hydrocyanic acid gas under tents, the dose being calculated to kill the usual insects present without damaging the trees.

[SHCHELKANOVTZEV (Ya. P.).] **Шелкановцев (Я. П.).** *Pedinus femoralis*, **L., on Sugar Beet Plantations in the Voronezh Government during the Summer of 1925.** [*In Russian.*]—*Défense des Plantes*, iv, no. 2, pp. 219–222, 3 figs., 1 ref. Leningrad, July 1927.

During the summer of 1925 the sugar-beet crop failed in the Voronezh government. The small plants above ground were eaten by the weevil, *Tanymecus palliatus*, F. The main damage, however, was caused by the large numbers of the larvae of the Tenebrionid, *Pedinus femoralis*, L. The germinating portion of the seed is eaten out by this beetle, the rest of the seed being left untouched. The special adaptation of the mouthparts of the larvae is discussed. The larvae were full grown by the end of May and pupated about the middle of June, the first adults appearing at the beginning of July. Under artificial conditions the first adult emerged 21st June 1925. The control of this beetle is very difficult, poison baits not having proved satisfactory, though it is possible that good results might be obtained with poisoned beet or maize seed. The best results under Voronezh conditions were obtained by hand collection at the time of hoeing the beet fields.

Other pests of beet are the Tenebrionid, *Opatrum sabulosum*, L., and the weevils, *Bothynoderes punctiventris*, Germ., and *Cleonus piger*, Scop.

[NIKOL'SKAYA (M. N.).] **Никольская (М. Н.). The Effect of the Injury to Apple Buds by** *Psylla mali*, **Schmidb., on the Size of the Adults of** *Anthonomus pomorum*, **L., emerging from them.** [*In Russian.*]—*Défense des Plantes*, iv, no. 2, pp. 222–225. Leningrad, July 1927.

Details are given of the measurements of adults of both sexes of *Anthonomus pomorum*, L., that emerged from apple buds attacked by *Psylla mali*, Schmidb. The injury apparently produced certain conditions unfavourable to the development of the weevils, as they were smaller than the individuals emerging from uninjured buds.

[Yakubyuk (A.).] **Якубюк (А.). Notes on the Activities of Bark-beetles of the Genus** *Crypturgus.* [*In Russian.*]—*Défense des Plantes*, iv, no. 2, pp. 225–226. Leningrad, July 1927.

It has been stated in recent literature that *Crypturgus pusillus*, Gyll., and *C. cinereus*, Hbst., have a distinct effect on the development of other bark-beetles [*Myelophilus minor*, Htg., and *M. piniperda*, L.] [*R.A.E.*, A, xiv, 608]. Studies on trap logs have shown that, where *C. cinereus* was not present, *M. minor* developed normally, but where it occurred, no living individuals of *M. minor* were found, and it has been definitely ascertained that *C. cinereus* attacks and kills the latter.

[Stark (V. N.).] **Старк (В. Н.). First Supplement to the List of Bark-beetles of the Bryansk Government.** [*In Russian.*]—*Défense des Plantes*, iv, no. 2, pp. 227–230, 4 figs., 2 refs. Leningrad, July 1927.

Although it is only a year since the previous list was published [*R.A.E.*, A, xv, 156], 11 further species are now recorded, including *Pityophthorus morosovi* and *Ips* (*Orthotomicus*) *starki*, attacking spruce, recently described by Spesivtzev [*R.A.E.*, A, xiv, 312; xv, 156]. The galleries of these beetles are described. *P. morosovi* pupates in the bark. It occurs in company with a number of other bark-beetles and usually selects trees at the edge of a forest where they are more or less exposed to sunlight. It is found in mixed stands of conifers as well as in those including deciduous trees and on various types of soil. *I. starki* has only been found on the edges of the forest in mixed stands of conifers and alders, occasionally accompanied by *Pityophthorus micrographus*, L., and *P*[*ityogenes*] *chalcographus*, L. It hibernates in the adult and egg stages, no other stages being found during the winter of 1926. There is one generation a year.

[Bondarovich (M. Ya.).] **Бондарович (М. Я.).** *Trioza* **sp. on Onions.** [*In Russian.*]—*Défense des Plantes*, iv, no. 2, pp. 235–238, 5 figs., 1 ref. Leningrad, July 1927.

Considerable injury was caused to onions in the Ukraine in 1925 by a Psyllid, *Trioza* sp., probably *T. brassicae*, Vas. [*R.A.E.*, A, xi, 304]. The various stages are described. Under natural conditions most of the eggs are laid near the base of the leaves; during July they hatched in 10–12 days. Under experimental conditions they hatched in 8 days when kept in a thermostat at a temperature of 30° C. [86° F.] and in the laboratory at a temperature of 15–20° C. [59–68° F.] in 17 days. The larvae attach themselves to the leaf and do not move away from the leaf on which they have hatched. As the total life-cycle of one generation is about 30 days, it is possible that under favourable conditions 4–5 generations may occur in a year. As they overlap, all stages may be found at the same time. During 1925 egg-laying was at its height towards the end of May and beginning of June, 15–20 eggs being laid on an average on one plant. The numbers of all the stages decreased in July, apparently owing to natural enemies such as Chrysopids and Coccinellids, but increased again in September. As a result of the injury the leaves of onion become deformed and the plant is retarded in growth.

Very similar Psyllids found on radish, cabbage and some weeds may all be different species of *Trioza,* though the species occurring on onion is very similar to *T. brassicae,* Vas., and under experimental conditions produced a generation on cabbage.

[BONDAROVICH (M. Ya.).] **Бондарович (М. Я.). The Leafhopper,** *Trioza brassicae,* **Vas., on Onions.** [*In Russian.*]—*Kharkov. Oblast. S.-Kh. Opuitn. Stantz.,* Ent. Dept., no. 8, 4 pp., 5 figs., 1 ref. Leningrad, 1927.

This paper is a reprint of the preceding one, the Psyllid concerned having now been definitely identified as *Trioza brassicae,* Vas.

[SAVZDARG (É. É.).] **Савздарг (Э. Э.). The Carrot Fly** (*Psila rosae,* **F.**) **and its Control.** [*In Russian*]—*Défense des Plantes,* iv, no. 2, pp. 238–242, 5 refs. Leningrad, July 1927.

An account is given of the bionomics of *Psila rosae,* F., and of the damage done by it to carrots in Russia [*cf. R.A.E.,* A, x, 49, 105]. The various stages are also described. The eggs hatch in 6–12 days. The larvae emerging from the eggs laid in the spring were observed up to the end of July. The first pupae were found about the middle of July. The majority of these pupae hibernate, but a partial second generation of the flies appears and lays eggs at the beginning of August; the larvae from these occur up to late autumn, their development continuing for 4–7 weeks. Some of these larvae do not pupate until the following May, but the adults from them emerge at the same time as those from the overwintering pupae. The greatest damage is done during June, when the larvae of the first generation attack the young early carrots, the injury affecting the flavour and marketable value of the crop. The larvae of the second generation attack the later crops; during 1924 they were found on those sown on 6th June and later. It may be possible to prevent injury by the judicious choice of a resistant variety and time of sowing.

Various methods with deterrents to prevent oviposition that have been recommended in other countries are reviewed. Further experiments should also be made with mercury bichloride (1 : 1,200), as almost all the eggs were killed when the soil under the plant was watered with 100 cc. Infested carrots when removed from the soil should be used at once as food or destroyed; they should be removed entire from the soil before the larvae have left the roots for pupation. Deep autumn ploughing cannot be recommended for the destruction of *P. rosae* as the flies readily emerge from a depth of 28 inches; crop rotation is an essential supplementary measure.

During 1924, 20 per cent. of the pupae were parasitised by a Braconid, *Dacnusa* sp., and this rose to 35 per cent. in 1925.

[ÉNGEL'HARDT (V. M.).] **Энгельгардт (В. М.). Pests of the Far East Region as observed in 1925.** [*In Russian.*]—*Défense des Plantes,* iv, no. 2, pp. 243–245. Leningrad, July 1927.

In this survey of the pests of various crops in the Far East of Siberia, a number of new records were made. Owing to the dryness of the spring and early summer *Phyllotreta vittula*, Redtb., was unusually abundant, causing serious injury to seedling grain crops; *Eurygaster* sp. and *Aelia* sp. were also abundant. Other field pests were *Agriotes*, *Oscinella frit*, L., and *Mayetiola* (*Cecidomyia*) *destructor*, Say, but the last two are almost negligible and only destroyed about 3 per cent. of the barley crop in 1925. The most serious injury during 1925 was caused by locusts, which were unusually abundant; they included *Prumna primnoa*, F.W., and *Stenobothrus* sp. Potatoes, beet and other vegetables were attacked by *Epicauta* sp., while about 90 per cent. of young onions were destroyed by *Eumerus* sp. In some localities potatoes and cucumbers were entirely destroyed by *Epilachna vigintioctopunctata*, F. Rice pests included a fly, probably *Oscinella oryzae*, Mats., and other unidentified pests including a Pyralid, possibly a species of *Chilo* or *Schoenobius*.

[OGLOBLIN (D. A.).] **Оглоблин (Д. А.). Description of the Larva of** *Chaetocnema breviuscula*, **Fald. (Coleoptera, Chrysomelidae).** [*In Russian.*]—*Défense des Plantes*, iv, no. 2, pp. 245–250, 11 figs., 2 refs. Leningrad, July 1927.

The larva of the Halticid, *Chaetocnema breviuscula*, Fald., is described in detail. It lives in the soil at a depth of 1¾ to 3½ inches, where it feeds on the secondary roots of *Chenopodium album* during June and the beginning of July. The adult beetles usually emerge during the second half of July. They feed on the leaves of beet, and when these get too coarse, they migrate to meadow and forest vegetation; beets are also attacked by the adults in the spring when they emerge from their winter quarters, but after about a fortnight they migrate to *C. album* and *Atriplex*, which are apparently the primary food-plants and the ones on which the larvae develop. As is the case with all Halticine beetles in European Russia, this species has only one generation a year.

[ÉNGEL'HARDT (V. M.).] **Энгельгардт (В. М.).** *Cirphis unipuncta*, **Haw., a new Pest of the Far Eastern Region.** [*In Russian.*]—*Défense des Plantes*, iv, no. 2, pp. 250–255, 1 fig., 2 refs. Leningrad, July 1927.

Cirphis unipuncta, Haw., was recorded for the first time from the Far East of Siberia as a serious pest during the summer of 1926. It is believed that it has been present in negligible numbers for some time and that it has probably been recorded erroneously as *Loxostege* (*Eurycreon*) *sticticalis*, L. The life-history and habits are similar to those in the United States. The various stages are described and the adults are compared with those of *C. conigera*, F., with which they may easily be confused. The seasonal history differs from that in the United States; there are apparently only two generations a year. The first adults appear in the middle of May and those of the second generation towards the end of July. The adults of the first generation oviposit during the second half of May, giving rise to larvae at the beginning of June, and these do the chief damage. They pupate during the first half of July in the soil at a depth of about 1–4 inches the pupal stage occupying 9–15 days. Oviposition of the second generation has not been observed, but it probably occurs in the second half of August, as larvae were found attacking winter rye during the second half of September. These larvae enter hibernation before they are fully grown ; they pupate in the following May. The food plants of *C. unipuncta* include various cereal and vegetable crops, oats being particularly seriously injured.

[Korsakova (M. V.).] **Корсакова (М. В.). The Gooseberry Sawfly** (*Pteronus ribesii*, **Scop.**). [*In Russian.*]—*Défense des Plantes*, iv, no. 2, pp. 255–275. Leningrad, July 1927.

This is a detailed account of the morphology, anatomy and bionomics of *Pteronus ribesii*, Scop., in different parts of the world. The information has been collated from existing literature as well as the author's observations in north Russia. In 1924 this pest occurred in abundance, producing two generations and a partial third. As the generations overlapped, the activities of the sawfly continued from 17th May to 17th September, causing considerable damage. The food-plants are gooseberry and red currant ; black currant even in the vicinity of infested bushes was never attacked. About 10 per cent. of the pupae were infected by the fungus, *Botrytis bassiana*, and an unidentified Chalcid parasitised a small proportion of the eggs ; the latter are also attacked by the larvae and adults of *Anthocoris nemorum*, L. An undetermined Ichneumonid attacked the larvae of the first and second generation both under natural and artificial conditions. The Tachinid, *Ptychomyia selecta*, Mg., is also a parasite of *Pteronus ribesii*, about 84 per cent. of the fifth stage larvae being infested.

It has been recommended that the soil under the bushes should be dug over in June and in the autumn so that the cocoons are buried too deep for the adults to emerge. In the author's experience this is not effective unless the soil is dug to a depth of about 8 inches in the spring and 12 inches in the autumn, and this method is likely to injure the roots, while some of the cocoons attached to the roots will survive. It is best to dig the soil near the plants to a depth of about 4 inches and to increase the depth to about 8 at a distance of 21 inches from the bushes. The soil should be heaped up round these. It is further recommended that two inches of the soil around the plants should be removed and buried deeply, fresh soil and a fertiliser being substituted. These measures, however, are not suitable for application on a large scale. Hand collection of larvae or spraying with hot water has not given satisfactory results, as it is impossible to reach all the larvae by either method.

Both Urania and Paris green have been tried as sprays, the latter with a double quantity of lime. Both substances killed all the larvae when used at the rate of 1 lb. to 95 gals. water. Red currants and gooseberries were sprayed on the 3rd July, three and half weeks before ripening, with 1 lb. Urania green, 3 lb. soap and 72 gals. water. One hour later the larvae were dying, and within 24 hours all were dead. After a fortnight the leaves showed signs of scorching, and after three and half weeks they began to drop. This dosage is apparently too high for currants, but not for gooseberries. Larvae of the second generation emerging a week and a half after spraying also succumbed.

As a result of these experiments, it is recommended that spraying should be done as soon as the larvae appear, using either 1 lb. of Urania green to 144 gals. of water or 1 lb. of Paris green to 115 gals. of water with the addition of a double quantity (2 lb.) of lime. If necessary, a second application should be made after 10–14 days and a third 3 weeks before the fruit ripens, increasing the strength of Urania green to 1 lb. to 115 gals. of water and that of Paris green to 1 lb. to 95 gals. of water.

[Bogdanov-Kat'kov (N. N.).] **Богданов-Катьков (Н. Н.). A Review of Coccinellids injurious to cultivated Plants.** [*In Russian.*] —*Défense des Plantes,* iv, no. 2, pp. 275–298, 30 figs. Leningrad, July 1927.

This paper forms the first of a series in which it is intended to deal with the insect pests, particularly those attacking vegetables, according to the groups to which they belong.

Keys are given to the genera and species of injurious Coccinellids, with descriptions of the various stages, and their distribution and bionomics are discussed.

[Zorin (P. V.).] **Зорин (П. В.). A Method of Rearing** *Trichogramma evanescens,* **Westw.** [*In Russian.*]—*Défense des Plantes,* iv, no. 2, pp. 316–319, 2 figs., 1 ref. Leningrad, July 1927.

Trichogramma evanescens, Westw., is a valuable egg parasite of *Barathra brassicae,* L., but as this pest and other Noctuid hosts of it only produce one generation a year in north Russia, experiments have been made in breeding the parasite under artificial conditions. By rearing the larvae from the egg to the pupal stage at about 30° C. [86° F.], over 60 per cent. of the pupae of *B. brassicae* and up to 80–90 per cent. of the pupae of *Polia oleracea,* L., will produce adults of the second generation without a diapause. It is important that the temperature be maintained during pupation and until the adults have emerged. The adults produced under these artificial conditions oviposit normally, though fewer eggs are laid than under natural conditions. Pupae collected in the spring, after hibernation, may be placed in the refrigerator and their development thus retarded for as much as 3 months. Pupae obtained in the summer may be placed at once in the refrigerator and kept at a temperature of 0° C. [32° F.] for at least 2 months. The pupae from the refrigerator may be forced to complete their development at any time by placing them in a warm atmosphere; thus adults may be obtained throughout the winter and their time of oviposition regulated to suit the parasite. The development of *T. evanescens* depends on temperature. Under natural conditions during the summer months, development is completed in 18–35 days. Under laboratory conditions at 14°–15° C. [57·2°–59° F.] development lasted 25–27 days, and at 30° C. [86° F.] 10–12 days. When the larvae of the parasite are kept at 10°–11° C. [50°–51·8° F.], they enter a diapause and do not pupate, so that parasitised eggs may be kept in a refrigerator in the summer and in a cold room in the winter and only brought into a warm atmosphere towards the end of May, thus ensuring a large number of parasites being ready for liberation at the beginning of the oviposition period of *Barathra* and *Polia*; in northern Russia this occurs in June.

Many Noctuids are parasitised by *T. evanescens,* of which *B. brassicae, P. pisi,* L., and *Naenia typica,* L., are the most suitable hosts for use under laboratory conditions as their eggs are the most convenient to handle.

[Rodd (A.) & Strelin (G.).] **Родд (А.) и Стрелин (Г.). An Experiment to estimate the Action of Sodium Arsenite on the Larvae of** *Vanessa urticae*, **L.** *[In Russian.]—Défense des Plantes*, iv, no. 2, pp. 369–372, 4 figs. Leningrad, July 1927.

Experiments on the amount of poison swallowed by the larvae of *Vanessa urticae*, L., are described. A detailed account is given of the technique employed in calculating the amount of sodium arsenite per leaf surface and the amount of leaf eaten by the larva, small potted nettle plants and cut leaves being used. The time required for the poison to affect the different larvae varies even when they belong to the same batch and cannot be taken as a criterion of the physiological action of the poison. At weak concentrations of 22 mg. to the sq. metre feeding varied from 2 to 7 days. As a rule the younger larvae succumb more quickly than the older ones, but their resistance to the poison is lowered again as they near pupation. The lethal dose of poison for the larva remains constant regardless of the concentration on the leaf surface.

[Gal'kov (V. P.).] **Гальков (В. П.).** *Cicadula (Jassus) sexnotata*, **Fall., in the Ural.** *[In Russian.]—Défense des Plantes*, iv, no. 2, pp. 374–375. Leningrad, July 1927.

During 1924 *Cicadula sexnotata*, Fall., occurred in great abundance about the middle of June in central Ural on spring-sown grain crops, particularly barley and oats. The infestation occurred mainly in close proximity to autumn-sown crops, which, however, were not attacked. All stages of the Jassid were present at the same time. It is believed that the insects hatching from eggs hibernated on the autumn-sown seedlings found these too coarse in June and migrated to the adjoining younger plants.

[Gal'kov (V.).] **Гальков (В.).** *Forficula tomis*, **Kol., as a Pest of Vegetable Crops in the Ural.** *[In Russian.]—Défense des Plantes*, iv, no. 2, pp. 378–379. Leningrad, July 1927.

During 1924 *Forficula tomis*, Kol., caused considerable injury to various crops such as potatoes, tomatos, various cucurbits and particularly to beets. The injury was done at night, both the leaves and stems being attacked. Poison baits of bran and Paris green did not attract the earwigs. The best results were obtained by treating the nests under débris with a kerosene emulsion, composed of 2 lb. soap, 1 gal. kerosene and 12 gals. water. The earwigs hit by this emulsion, whether in the adult or larval stage, died in 3–5 minutes.

[Dekhtyarev] Dekhtiarev (N. S.). *Poeciloscytus cognatus*, **Fieb. (Hemiptera, Miridae) as a Serious Pest of Sugar-beets.**—*Bull. Ent. Res.*, xviii, pt. 1, pp. 1–3, 2 figs., 1 ref. London, September 1927.

In the summer of 1926 an outbreak of the Capsid, *Poeciloscytus cognatus*, Fieb., caused great losses on sugar-beet in the Ukraine. The nymphs were first observed in the middle of May, usually in cracks in the ground, under lumps of earth, on weeds and also on the beet plants. The half-grown nymphs were mostly found on the lower surface of the leaves sucking the juices of the plant ; this caused the leaves to wither until the whole plant dried up, and the fields had, consequently, to be resown several times. The adults began to appear at the end of May, reached their maximum numbers in the middle of June and decreased from 18th June until only isolated specimens were found at the end of the month. The half-grown nymphs of the next generation were observed in numbers in July, but did comparatively little damage. The winter is passed in the egg stage. Since the bugs rarely appear in well cultivated fields and are only very numerous where such weeds as *Chenopodium, Atriplex* and *Salsola* are abundant, it is probable that they oviposit on them. This theory is supported by the fact that beets planted after the winter crop were practically uninjured, while on the average more than half of those sown in fallow ground in which weeds were present were destroyed.

One of the most effective measures for controlling the bugs is therefore the destruction of weeds in the autumn. Beets should be planted early, since older plants are better able to resist the bugs when they appear. Weeds should not be hoed up after the bugs have hatched, for this merely drives the insects on to the beet plants, and greatly increases the damage. Moreover, the bugs themselves will destroy the weeds.

Good results in controlling these bugs have also been obtained by spraying with a soft soap solution or kerosene emulsion or dusting with sulphur powder as used against *Psallus seriatus*, Reut. [*R.A.E.*, A, xiv, 631]. Both these methods are, however, too expensive to be used on the large scale necessary in the Ukraine, and the author therefore describes a special apparatus employed to catch Halticids and other pests of beet. This consists of a board about two or three yards long with a wheel about 18 inches in diameter at each end. A piece of stout cloth is nailed on behind with the lower edge nearly touching the soil. The lower surface of the board is smeared with molasses, or preferably with tanglefoot, and the insects disturbed by the cloth jump from the leaves and stick to the board. They are scraped off together with the molasses from time to time, and the board is re-smeared. More adults than nymphs are caught by this method, which should be used only on clear sunny days when the insects are especially active.

THOMPSON (W. R.). **On the Effect of Methods of Mechanical Control on the Progress of Introduced Parasites of Insect Pests.**—*Bull. Ent. Res.*, xviii, pt. 1, pp. 13–16, 1 ref. London, September 1927.

Parasites imported from the native home of introduced pests often take a considerable time to become sufficiently abundant to exert any appreciable influence on their hosts, and it is often necessary to use mechanical methods of control as a temporary measure during this period. These methods may affect the parasite as well as the host, and the author here deals with the effect they have on the progress of he natural enemies, and whether or not they are prejudicial to ultimate biological control, by reducing the problem to mathematical terms.

When the initial number of parasites is small compared with the initial numbers of hosts, it is only necessary to consider cases where the reproductive rate of the parasite is greater than that of its host, since control when the rate is less than or equal to that of the host is impossible or obtained after so long a period that its possibility is of no practical value. Thus the time required for control of the host by the parasite is not affected by mechanical methods provided that the proportions of hosts and parasites destroyed are equal. When the elimination of parasites as compared with hosts rises above a certain point, the advantage in reproductive rate is annulled and control will ordinarily be a practical impossibility. Thus the employment of mechanical methods that are favourable to the host in any marked degree would have disastrous effects on the progress of the parasite. The effect of mechanical methods favouring the parasite is much less marked than of those favouring the host ; a rise in the proportion of hosts escaping causes a rapid increase in the time required for control, which is only slightly diminished by an increase in the proportion of parasites escaping. The method of collecting insect pests and keeping them in containers to allow the parasites to escape is not normally to be recommended. It usually affects only a fraction of the insect population, and only confers a slight numerical advantage on the parasite, so that the progress of events will not be materially affected.

Hopkins (G. H. E.). **Pests of Economic Plants in Samoa and other Island Groups.**—*Bull. Ent. Res.*, xviii, pt. 1, pp. 23–32, 1 pl., 1 fig., 23 refs. London, September 1927.

This list of the pests of economic plants of the Samoa, Tonga and Ellice Islands is compiled from observations made by the author and Dr. P. A. Buxton during 1924 and 1925, and the records of other writers. Many of these have already been noticed [*R.A.E.*, A, ii, 555 ; iv, 128 ; xii, 272].

Except where otherwise stated the records are from Samoa, and they include : The Phasmid, *Graeffea cocophaga*, Newp., which is a serious pest of coconuts in Samoa and is also common in Fiji, Tonga and other groups of islands in the Pacific ; the Pentatomid, *Tectocoris lineola* var. *tongae*, Boisd., which was not found in Samoa, but was observed in Tonga, where all stages attacked cotton bolls ; the Coreids, *Leptocorisa varicornis*, F., which occurred on egg-plant [*Solanum melongena*] though it is not known as a pest, and *Leptoglossus australis*, F., on cucumber ; the Pyrrhocorids, *Dysdercus sidae*, Montr., on *Hibiscus* spp. and kapok (*Eriodendron* sp.) in Samoa and on cotton in Tonga, and *D. impictiventris*, Stål, on *H. tiliaceus* in Samoa ; the Delphacids, *Megamelus proserpina*, Kirk., which was very common on taro (*Colocasia esculenta*) in Samoa and has been recorded from Fiji, Java and the Philippines, and *Peregrinus maidis*, Ashm. ; the Aleurodid, *Neomaskellia bergi*, Sign., which is an important pest of sugar-cane in Fiji, and is occasionally abundant in Samoa ; the Coccids, *Asterolecanium bambusae*, Boisd., on bamboo in the New Hebrides, *Pseudococcus citri*, Risso, on a variety of food-plants including lemons and cashew [*Anacardium occidentale*], also recorded from cotton in the New Hebrides, *P. cocotis*, Mask., on seedling coconut stems under mud galleries made by ants, *Ceroplastes rubens*, Mask., on cinnamon, fern and other plants, also recorded from *Melaleuca* sp. in New Caledonia, *Pulvinaria psidii*, Mask., on lemon leaves in the New Hebrides, *Eucalymnatus tessellatus* var. *perforatus*, Newst., on cinnamon and *Morinda citrifolia*, *Coccus acuminatus*, Sign., on pineapple in Samoa and on fern in the New Hebrides, *Coccus hesperidum*, L., on leaves of *Carica papaya*, *Saissetia coffeae*, Wlk., on *Morinda citrifolia* and lemon, *S. nigra*, Nietn., on several plants including *Hibiscus rosasinensis* in Samoa, on Swain's Island and in the New Hebrides, and *Pinnaspis minor*, Mask., on coconut leaves in the Ellice Islands and on banana on Swain's Island ; the Aphid, *Toxoptera aurantii*, Boyer, on leaves of cacao and of *Hibiscus tiliaceus* ; the termites, *Microcerotermes peraffinis*, Silv., on coconut, mango and other trees, *Prorhinotermes inopinatus*, Silv., eating paper stored in a damp cupboard, *Calotermes rainbowi*, Hill, on coconuts in the Ellice Islands, and *C.* (*Cryptotermes*) *buxtoni*, Hill, destroying woodwork ; the Coccinellid, *Epilachna vigintioctopunctata*, F., a serious pest of cucumber, also found on egg-plant ; the Clerid, *Necrobia rufipes*, DeG., in stored food and dried fruit in Samoa, Tonga and Fiji ; the Dynastid, *Oryctes rhinoceros*, L., the control measures for which are briefly discussed ; the Cerambycid, *Haplohammus ?coenosus*, Kirby, on *Poinsettia* ; the Galerucid, *Aulacophora similis*, Oliv., eating the flowers of cucurbits (this being probably the species doubtfully recorded by Swezey as *A. fabricii*, Baly [xii, 272]) ; the Cassidid, *Metriona strigula*, Montr., on sweet potato (*Ipomoea batatas*) ; the Scolytid, *Dacryphalus* (*Cryphalus*) *mangiferae*, Stebb., bred from mango ; the Noctuids, *Prodenia litura*, F., on the leaves of taro and in tomato fruit, *Othreis fullonica*, L., on *Erythrina* (the larvae of this moth being attacked on several occasions by *Forcipomyia* sp.), *Heliothis assulta*, Guen., recorded as a tobacco pest, and *Phytometra chalcites*, Esp., eating leaves of cucumber and tomato ; the Sphingid, *Hippotion celerio*, L., previously recorded from taro, also attacking *Alocasia macrorrhiza* and other Aroids ; the Pyralids, *Corcyra cephalonica*, Staint., in stored rice, *Lamprosema diemenalis*, Guen., eating the leaves of beans (an undetermined Chalcid being bred from the pupae), *Sylepta derogata*, F., found curling the leaves of *Hibiscus tiliaceus*, and *Maruca testulalis*, Geyer, eating the interior of bean pods ; the Tortricids, *Crocidosema plebeiana*, Zell., on *Hibiscus* and other Malvaceous plants in Samoa, Tonga and Fiji, and *Polychrosis botrana*, Schiff., in Samoa and the Ellice Islands ; the Tineids, *Agonoxena argaula*, Meyr., attacking coconuts in Samoa, the Ellice Islands and Fiji, a species of *Plutella*, probably *P. maculipennis*, Curt. (*cruciferarum*, Zell.) on cauliflowers, *Prays citri*, Mill., on *Citrus*, also recorded from Fiji, *Platyedra gossypiella*, Saund., on cotton, and *Phthorimaea heliopa*, Low. ; and the Trypetid, *Dacus* (*Chaetodacus*) *xanthodes*, Broun, the common fruit-fly in Samoa, on bread-fruit [*Artocarpus incisa*] and other fruits including tomato, the latter showing no external injury.

The author considers that Swezey's record of *Cosmopteryx dulcivora*, Meyr., on sugar-cane in Samoa is extremely doubtful, since no adults were obtained and the determination was based on the similarity of the damage to that done by *C. dulcivora*. The Coccinellid, *Coccinella transversalis*, F., was found destroying Aphids on cucumbers and other plants.

WILKINSON (D. S.). **Eight New Species of Braconidae.**—*Bull. Ent. Res.*, xviii, pt. 1, pp. 33–46, 12 figs. London, September 1927.

The new species of Braconids described are : *Microbracon kirkpatricki* from *Platyedra gossypiella*, Saund. (pink bollworm) in Kenya Colony and Tanganyika Territory ; *Rhaconotus scirpophagae* from the Pyralid, *Scirpophaga auriflua*, Zell., in sugar-cane in Bihar, also recorded from Tanganyika Territory from a rice stem ; *R. sudanensis* bred from cotton stems containing the Buprestid, *Sphenoptera gossypii*, Cotes, in the Sudan; *Opius afreutretae* bred from the pupae of *Afreutreta discoidalis*, Bezzi, and from *A. bipunctata*, Lw., and *Acanthiophilus muiri*, Bezzi, from South Africa; *Opius phaeostigma* bred from Dipterous, probably Trypetid, pupae, from Natal; *Opius cosyrae* from the Trypetid, *Ceratitis* (*Pardalaspis*) *cosyra*, Wlk., from Tanganyika Territory; *Meteorus margaroniae* bred from the larvae of the Pyralid, *Diaphania* (*Margaronia*) *dimorpha*, Janse, from South Africa; and *Meteorus komensis* from Uganda. A key to the species of *Rhaconotus* is given.

The author explains the system of terminology adopted in describing the wings of Braconids.

DAVIDSON (J.). **On some Aphides infesting Tulips.**—*Bull. Ent. Res.*, xviii, pt. 1, pp. 51–62, 1 pl., 7 figs. London, September 1927.

The alate and apterous viviparous females of *Anuraphis tulipae*, Boy., on tulip and iris, and *Rhopalosiphoninus tulipaella*, Theo., and *Macrosiphum gei*, Koch, on tulip, are described in detail. The first two are important pests of stored bulbs, but *M. gei* has only been found by the author on the aerial parts of the plants. The latest measures of control are discussed [*R.A.E.*, A, xii, 62; xiv, 113]. Essig recommends that infested bulbs should be soaked for several hours in 1 pt. 40 per cent. nicotine sulphate solution to 1,000 pts. water or thoroughly covered for a similar period with 2 per cent. pure "nicodust." Bulbs received for storage should be carefully inspected and those found to be infested should be isolated for treatment. Clean bulbs may become infested by crawling apterous forms as well as by alate individuals. Colonies of Aphids forming on the green leaf-spathes of early tulips in glasshouses should be sprayed with a dilute nicotine-soap emulsion, since it is in the early stage of development of the leaves that the damage causing distortion of the plant occurs, and, moreover, the Aphids are more difficult to destroy once they are hidden in the folds of the opening leaves.

WILLIAMS (C. B.). **A Chart-recording Weighing Machine for Bee-keeping or other Research.**—*Bull. Ent. Res.*, xviii, pt. 1, pp. 63–65, 1 pl., 1 fig. London, September 1927.

A detailed description is given of an apparatus for recording continuously the weight of a hive of bees to show the daily periods of activity and honey-collecting, the effect of high mid-day temperature, etc.

RAMAKRISHNA AYYAR (T. V.). **The Parasitic Hymenoptera of Economic Importance noted from South India.**—*Bull. Ent. Res.*, xviii, pt. 1, pp. 73–78, 2 refs. London, September 1927.

This list of the parasitic Hymenoptera of economic importance hitherto recorded from South India is arranged under the families, with notes on bionomics, distribution and synonymy. The two previous lists [*R.A.E.*, A, ix, 214; x, 183] have been revised, and further data added.

KIRKPATRICK (T. W.). **Notes on a Braconid Parasite of the Pink Boll-worm** (*Platyedra gossypiella*, **Saund.**) **in Kenya Colony.**—*Bull. Ent. Res.*, xviii, pt. 1, pp. 47–50. London, September 1927.

During investigations on the coast of Kenya Colony in November 1926, *Platyedra gossypiella*, Saund. (pink bollworm) was found to occur in every plot of cotton visited, and a certain proportion of the larvae were parasitised by the Braconid, *Microbracon kirkpatricki*, Wlknsn. In this locality cotton is sown towards the end of May, the picking season ends in March and there is a close season of about two months in each year. The climatic conditions are always equable, so that the larvae of *P. gossypiella* do not undergo a resting period, and it is presumed that during the close season breeding takes place on some of the wild Malvaceous plants common in the district. The usual number of parasites emerging from each larva appears to be two or three, four having been observed in one instance. The total life-cycle of the parasite occupied not more than 27 days and possibly as few as 19 in the laboratory, where the temperature ranged approximately from 65°–75° F. Presumably it would be considerably shorter in the warmer climate of the coast. Cocoons are usually constructed in the cotton lint or in the seed hollowed out by the host. No hyperparasite of this species has been observed. It is estimated that the rate of parasitism in open bolls was approximately 76 per cent., and in unsplit green bolls about 44 per cent. It is not certain whether the parasite can oviposit through the carpel wall of the boll, since some of the unsplit bolls had exit holes made by previous pink bollworms or by the larvae of *Earias* through which the parasite may have entered. It is probable that the parasite usually oviposits in larvae that are nearly full fed. No case has been observed of a parasitised larva pupating. It is not known how long the adults normally live under the climatic conditions prevalent on the coast, but from experiments in the laboratory with approximate temperatures of 73°–75° F. maximum and 64°–66° F. minimum, and in cold storage with temperatures ranging between 52°–67° maximum and 49°–61° minimum, it appears that they can be easily kept alive for three to four weeks. No water or food was given them, unless any suitable food was contained in the dry cotton boll enclosed with them, or condensation of moisture occurred inside the box when it was put in the ice-chest. In order to determine whether it was possible to breed the parasites in captivity, four males and five females were placed with three last-stage larvae of *P. gossypiella*. All three larvae were parasitised, and seven male parasites emerged. Pairing was not observed, and it is suggested that the offspring of unfertilised females are always males. It should not be difficult to ascertain the conditions necessary for pairing ; possibly food of some sort is required. The low percentage of infested bolls throughout the season was believed to be due to the activities of this parasite. Its importation into other countries where it might be of value would not appear to be difficult.

WOLCOTT (G. N.). **Haitian Cotton and the Pink Bollworm.**—*Bull. Ent. Res.*, xviii, pt. 1, pp. 79–82, 1 ref. London; September 1927.

Native cotton is an important crop in Haiti though it can scarcely be called cultivated, since under the most favourable conditions it is self-sown and grows like a weed, and the great bulk of the crop receives little attention other than picking ; it is profitable largely because of the low cost of production, and hardly any attempt has been made to control insect or fungous pests.

In one locality where the rainfall is deficient *Tetranychus telarius*, L., may be abundant in the autumn, but since what is considered to be a normal crop is produced, measures for its control are never seriously contemplated. Scattered infestations occur elsewhere, but are usually controlled by rain. *Alabama argillacea*, Hb. (cotton leaf caterpillar) is also an apparently serious pest that ordinarily appears two or three times every year and entirely defoliates the plants, but unless it happens to be particularly abundant at the time the squares and flowers are being produced, the vigour of the native plants enables them to outgrow the attacks and produce normal crops. In the few instances where cotton had been repeatedly treated with poison to control *A. argillacea*, *Aphis gossypii*, Glov. (cotton aphis) appeared in large numbers, but was soon succeeded by numerous parasitic and predacious enemies, such as *Aphidius*, *Baccha*, *Scymnus* and *Chrysopa*.

The apparent susceptibility of Haitian cotton to boll-rots and diseases may be the result of numerous wounds made by *Dysdercus andreae*, L., and recent experiments have shown that the persistent collection of the bugs during December and January, when they first appear on cotton, has resulted in a great reduction of boll diseases as well as of the number of bugs themselves. *Saissetia coffeae*, Wlk. (*hemisphaerica*, Targ.) and *Pinnaspis* (*Hemichionaspis*) *minor*, Mask., sometimes become abundant on the main stems and branches, but this usually occurs when the plants are allowed to become trees, and heavy infestations are largely prevented if the plants are cut close to the ground each year. *Eriophyes gossypii*, Banks (blister mite) seldom attacks native cotton, although it may be common on introduced varieties.

The exact date of the introduction of the pink bollworm [*Platyedra gossypiella*, Saund.] is not known, although it was found to be present everywhere in Haiti in 1924. It is very difficult to find infested bolls of native cotton, but this scarcity is not due to exceptional climatic conditions, for other varieties are heavily infested. December to March are the only months when native cotton has bolls on which the larvae of *P. gossypiella* could feed, but the scarcity of the bollworm is not attributable in any very large measure to this short crop season, since plants of other varieties that are not restricted to the winter months for boll formation are scattered throughout the country and even interspersed with native cotton, and the bolls on these plants are almost invariably heavily infested. Experiments in exporting Haitian cotton to ascertain whether it would retain its immunity in other countries have been made, but the results are not yet available. It appears probable, however, that it will retain its immunity in any country where climatic conditions are substantially similar to those obtaining in the West Indies, though it probably could not mature a crop in countries where frosts occur, as it does not flower before December.

Golding (F. D.). **Notes on the Food-plants and Habits of some Southern Nigerian Insects.**—*Bull. Ent. Res.*, xviii, pt. 1, pp. 95–99. London, September 1927.

A tabulated list is given of Lepidoptera, Rhynchota and Coleoptera occurring in Southern Nigeria, showing their food-plants and time of occurrence, together with brief additional notes in some cases.

Day (M. P.). **The Case and Faggot Moths.**—*Aust. Mus. Mag.*, iii, no. 4, pp. 141–144, 6 figs. Sydney, October–December 1927.

The larvae of *Oeceticus* spp. sometimes injure young gum [*Eucalyptus*], pine, peach and ti-trees [*Cordyline*], in Australia by eating the tender outer covering of the leaves and twigs and causing the trees to become stunted and malformed. The complete life-cycle takes rather more than 2 years. The young larvae first appear in September–October, and 3–4 hours after emergence each has formed a case in which it lives, with its head protruding for feeding. After 18–20 months, the larva fastens the case to a twig and pupates. The pupal stage may last as long as 7 months. The female moth does not leave her shelter, but after pairing, lays her eggs and dies. Various birds destroy large numbers of the young larvae.

New Zealand : Fungicides and Insecticides Act, 1927.—1927, no. 17, 4 pp. Wellington, 21st October 1927.

This Act, which comes into force 1st April 1928, regulates the manufacture and sale of chemical insecticides, fungicides and weed-killers.

Ogilvie (L.). **Diseases and Pests of Sweet Potatoes in Bermuda.**—*Agric. Bull. Bermuda Dept. Agric.*, vi, no. 8, p. 5. Bermuda, August 1927.

Insects attacking sweet potatoes in Bermuda include the flea-beetles, *Epitrix parvula* and *Chaetocnema apricaria*, which feed on the leaves and can be easily controlled by spraying with Bordeaux mixture as a repellent ; the mite, *Paratetranychus tumidus*, which collects on the lower surfaces of the leaves, where it spins webs and causes considerable dying off ; and *Euscepes batatae*, which occasionally attacks the tubers, within which it completes its life-cycle, but may be controlled by planting clean sets, crop rotation, early harvesting and destruction of infested stems and tubers.

Roebuck (A.). **The Use of Poultry against Pests of Fruit Crops.**—*Bull. Midland Agric. & Dairy Coll.*, no. 16, 31 pp. Sutton Bonington, Loughborough, May 1927.

As the result of tests by artificial feeding and by field observation, combined with studies to ascertain whether pests inaccessible to fowls while doing damage can either be controlled by them at another stage or be brought within their reach by artificial means, such as ploughing, a calendar has been drawn up showing the particular stage of all species of insect pests of orchards that might possibly be combated by poultry from month to month, whether in the soil, on the fruit trees or in miscellaneous shelters. A list of fruit pests against which some measure of control is obtained by keeping fowls is also given.

Light (S. F.). **A new and more exact Method of expressing important specific Characters of Termites.**—*Univ. Calif. Pub. Ent.*, iv, no. 5, pp. 75–88, 2 figs. Berkeley, Cal., 1927.

An attempt is made to express the relative differences in the various species of termites in ratios by stating one dimension in terms of another, the characters treated being ratio of head length to head width, maximum to minimum width, pronotum length to width, gular length to width, and the "fontanel index." This is secured by dividing length of head to posterior rim of fontanel aperture by length of head from posterior margin to the line that joins the anterior limits of chitinisation of the head capsule.

This method is applied to 13 species of the genus *Coptotermes*, representative of the tropics of the world, including Oriental, Papuan, Australian, Madagascan and Central American species. The significant values for soldiers of these species appear to be head contraction index, fontanel index and gular contraction index, or head length in terms of minimum gular breadth. Investigation will be necessary to determine whether the conditions found true for these species prevail throughout the genus. These values are shown to be significant for other genera of termites, and together with other values suited to the particular characters of each genus they should furnish the much-needed characters for an exact definition of the species.

STROUHAL (H.). **Die Larven der palaearktischen Coccinellini und Psylloborini (Coleopt.).**—*Arch. Naturgesch.*, Abt. A, xcii (1926), no. 3, pp. 1–63, 15 figs., 108 refs. Berlin [1927].

This is a study of the morphological and biological relations of the larvae of the above Coccinellids with keys intended to enable the more important palaearctic species to be identified in the larval stage. Eighteen genera are described, with notes on the morphology of one or more species of each and on their food-plants or the insects they attack.

MORDVILKO (A.). **Les Pemphigiens des pistachiers et leurs formes anolocycliques.**—*Mém. Soc. zool. Fr.*, xxviii, no. 3–5, pp. 61–75, 26 refs. Paris, 30th October 1927.

This paper is similar to, but fuller than, one already noticed [*R.A.E.*, A, xv, 652]. A Pemphigine found on the lower surface of leaves of *Pistacia vera* in Turkestan is described as *Slavum lentiscoides*, gen. et sp. n.

TOUMANOFF (K.). **Essais sur l'immunisation des abeilles.**—*C.R. Acad. Sci. Fr.*, clxxxv, no. 20, pp. 1078–1080, 2 refs. Paris, 1927.

Experiments in immunising bees against European foulbrood by injections of *Bacillus alvei* between the abdominal segments, showed that they can gradually acquire immunity from lethal doses of this bacillus.

ROUBAUD (E.). **Sur les préférences trophiques de la pyrale du maïs** (*Pyrausta nubilalis*). **Importance de l'armoise commune** (*Artemisia vulgaris*) **comme plante d'élection déviatrice, pour la protection des cultures.**—*C.R. Acad. Sci. Fr.*, clxxxv, no. 21, pp. 1158–1160. Paris, 1927.

The damage done by *Pyrausta nubilalis*, Hb. (European corn borer) appears to be generally limited in Europe, where it is endemic, whereas it seriously threatens the agricultural development of parts of Canada and the United States. It is possible that its importance as a pest in

America might be reduced by the introduction of plants other than maize that attract it in Europe. In the neighbourhood of Paris *Artemisia vulgaris* supports attack by *P. nubilalis* better than maize and is better suited to its development, as is shown by the fact that the author bred out successfully 25 per cent. on *A. vulgaris* as against 6·3 per cent. on maize. When plants of *A. vulgaris* and of maize were exposed to attack by moths in a very large wire cage out of doors, the former was heavily infested, while of 57 maize plants, 43 escaped attack entirely, and most of the remaining 14 were very lightly attacked, in spite of the fact that the area covered with *Artemisia* was less then half that on which maize was grown. The author believes that associations of *P. nubilalis* with its favourite plants play a large part in restricting its effects in Europe, and that while, probably, such associations have not yet been established in the recently invaded areas of North America, it would be worth while encouraging them.

[Ogloblin (D. A.).] **Оглоблин (Д. А.). Instructions for making Observations on the Halticini injurious to Beet.** [*In Russian.*]—15 pp., 18 figs. Kiev, Sakharotrest, 1927.

A short account is given of the life-history of Halticini in general, with instructions for their collection and study. A key to the species occurring in beet fields, mainly in the Ukraine and the southern part of Central Russia, includes notes on their other food-plants and habits.

Yuasa (H.). **Notes on the Japanese Chrysomelidae I. On the Food-plants of several Species (1).** [*In Japanese.*]—*Kontyu*, ii, no. 2, pp. 130–133. Tokyo, September 1927.

A list is given of a number of Japanese Chrysomelids with their food-plants, including the following: *Gastrolina thoracica*, Baly, on *Juglans sieboldiana*; *Nodostoma fulvipes*, Mot., on vine (*Vitis vinifera*), *Pyrus*, etc.; *Metriona thais*, Boh., on *Prunus*, *Pyrus*, etc.; and *Monolepta dichroa*, Harold, var. *apicipennis*, Jacoby, on crucifers, soy-bean, melon, cotton, mulberry, hemp, sweet potato, hops, etc.

Murata (J.) & Sekiya (I.). **On** *Phloeothrips oryzae*, **Mats., the Cause of the White Ears of Wheat.** [*In Japanese.*]—*J. Plant Prot.*, xiv, pp. 512–519. Tokyo, September 1927.

The thrips, *Phloeothrips oryzae*, Mats., has been very injurious to wheat and rice plants in recent years in the Nagano Prefecture. It infests the young ears of wheat, turning them white in colour, and the distal parts of the leaves of rice, causing them to curl. There seem to be two generations a year, the adults emerging at the end of June and again in August, but all stages may be observed throughout the summer. The winter is passed in the adult stage in sheltered places.

Kobayashi (G.). **On** *Nymphula interruptalis*, **Pryer, a Pest of** *Nymphaea*. [*In Japanese.*]—*Insect Wld.*, xxxi, no. 10, pp. 334–338. Gifu, October 1927.

The Pyralid, *Nymphula interruptalis*, Pryer, has two generations annually, wintering among grasses near water, but all stages are found throughout the summer and autumn in Yokohama. The larvae, which attack water-lily (*Nymphaea*), live between two pieces of leaf spun together and feed on other leaves.

RAMACHANDRA RAO (Y.). **The "Pollu" Disease of Pepper.**—*J. Madras Agric. Stud. Un.*, January 1926, reprint 6 pp. Madras, 1926. [Recd. October 1927.]

The word "pollu" means hollow, and usually refers to the occurrence in pepper (*Piper nigrum*) of berries that have been hollowed out, chiefly by insect agency, but in a wider sense it is used to signify the aggregate loss of crop brought about by several distinct factors, including the flea-beetle, *Longitarsus nigripennis*, Mots. [*R.A.E.*, A, ix, 214], a Cecidomyiid [*R.A.E.*, A, xiv, 325] and the fungus, *Colletotrichum necator*. The main crop loss is not due to individual berries becoming damaged by insect or fungus attack, but to the enormous amount of spike fall due to *C. necator* that occurs at the time of maturity, especially in wet years. Bordeaux mixture, applied at strengths varying from ½ to 2 per cent., with the addition of casein, resin-soda or fish-oil resin soap as an adhesive, gave excellent results as regards the control of spike fall and resulted in a conspicuous absence of insect or fungus injury, acting as a repellent to the ovipositing females of *L. nigripennis*. Unfortunately, however, the berries on the treated plants took longer to mature and the plants were themselves attacked by *Pseudococcus virgatus*, Ckll., and *Pinnaspis* (*Chionaspis*) *aspidistrae*, Sign. These Coccids increased after harvest (while the unsprayed plants remained free from attack) and were so abundant by April and May that many of the runners were killed. The Bordeaux mixture probably destroyed certain fungi that usually keep the Coccids in check.

HALLAGE (R.). **The "Doudet el Zareh"** (*Scythris temperatella*).—*Int. Bull. Plant Prot.*, i, no. 6, pp. 86–89. Rome, July 1927.

The Tineid, *Syringopais* (*Scythris*) *temperatella*, Led., one of the worst wheat pests in Syria, occurs in young wheat, barley, wild oats, grasses and weeds. In the Aleppo district the moths appear in April or May, occasionally in February. The eggs are laid just under the surface of the soil in May and hatch in June. The young larvae pass the summer and part of the autumn in a latent state and become active again only when the ground is covered with growing plants, into the leaves of which they burrow. The attack is severe so long as the season is dry. Deep ploughing after the harvest kills the larvae that hatched in June; all weeds that harbour the pest should be destroyed by ploughing, and all neighbouring ground should be cleaned. Clean ground is best sown with some summer crop such as cotton or water-melon. Starlings and crows destroy large numbers of the pest. Light-traps appear to be effective, and the moths can also be destroyed by spraying with a solution of 1 part sulphuric acid in 45 parts water.

BALL (E.), MANN (C. E. T.) & STANILAND (L. N.). **Strawberry Investigations at Long Ashton.**—*J. Minist. Agric.*, xxxiv, nos. 6 & 7, pp. 497–510 & 627–641, 25 figs., 15 refs. London, September & October 1927.

In consequence of the unsatisfactory strawberry crops obtained in England in recent years, a thorough investigation was instigated, which revealed, among other data, the importance of the strawberry aphis, *Capitophorus fragariae*, Theo. This pest had been observed for some years without arousing much interest. No egg stage has been found. The Aphids are present all the year round and reproduce entirely viviparously; winged forms, which are also viviparous, are produced throughout the year, but chiefly in late summer and early autumn. During the winter the Aphids feed very slightly on the older leaves and reproduction is very slow; in spring the rate of reproduction increases considerably. Runners from infested plants usually become infested at an early stage, the Aphids travelling along the stolons to the young developing leaves. Their attack causes the production of characteristic yellowish-green, cupped and crinkled leaves, and the check to the crown leads to abnormally early production of lateral crowns, for which the root system is inadequate; the leaf-stalks are short and fleshy and the plants have a flattened appearance and generally bear numerous weak blossoms, while the fruit is small and frequently deformed. The resistance of different varieties of strawberry varies greatly, and the importance of choosing Aphid-resistant varieties cannot be over-estimated. The chief varieties are discussed with regard to this characteristic.

The remedial measures suggested at this stage of the work are the planting of runners free from all symptoms of attack, taken from healthy plants. Before planting all runners should be dipped in a solution of ½ oz. 98 per cent. nicotine in 10 gals. water, with sufficient soap to produce a lather. They require immersion only until thoroughly wet, or the tops only may be immersed, leaving the soil round the roots undisturbed. Dipped runners planted in the autumn will remain free from Aphids until the following spring. Any plants that develop symptoms of attack should be removed and burnt, and the remaining ones should be sprayed with the dipping solution as a preventive, or they may be dusted with a nicotine dust, which should reach particularly the crowns and the lower surface of the leaves. It is most important that the plants should be free from Aphids in late summer and early autumn, when the new root system is being formed; spraying and dusting should therefore be practised immediately after the crop is gathered.

BARNES (H. F.). **Four British Aphid-eating Gall-midges.**—*Entomologist,* lx, no. 771, pp. 174–180. London, August 1927.

A key is given to the females of four species of *Phaenobremia*, Kieff., recently reared from larvae feeding on Aphids, *viz.*, *P.* (*Aphidoletes*) *meridionalis*, Felt (an American species recorded for the first time from the British Isles) on *Phorodon humuli*, Schr., and *P. rosae*, sp. n., on *Anuraphis roseus*, Baker, both in Kent; *P. helichrysis*, sp. n., on *A. helichrysi*, Kalt., in Ireland; and *P. macrorosae*, sp. n., on *Macrosiphum rosae* var. *glauca*, Buckt., in Scotland.

BRAUN (K.). **Bericht über das Auftreten von Schädlingen und Krankheiten im Obstbau im Regierungsbezirk Stade während der Monate Juni, Juli und August 1927.** [Report on Pests and Diseases in Orchards in the District of Stade from June to August 1927.]—*Die Landwirtschaft,* nos. 41–42 (Beilage zum *Stader Tageblatt*), reprint, 2 pp. Stade [1927].

A list is given of the insect pests observed in the fruit-growing district of Stade, on the Lower Elbe, near Hamburg, with notes on them.

ZILLIG (H.). **Spritz- und Staubgeräte für den Pflanzenschutz.** [Spraying and Dusting Apparatus for Plant Protection Work.]—*Flugbl. biol. Reichsanst. Land- u. Forstw.*, no. 89, 8 pp., 15 figs. Berlin, July 1927.

This circular describes the best-known types of spraying and dusting apparatus of German manufacture.

SPEYER (W.). **Der Apfelblattsauger** (*Psylla mali* **Schmidberger).** [The Apple Leaf Sucker.]—*Flugbl. biol. Reichsanst. Land- u. Forstw.*, no. 90, 4 pp., 3 figs. Berlin, October 1927.

A very brief description is given of *Psylla mali*, Schm., with an account of its biology. The adults occur from May to October. Oviposition begins in August and may last into November, each female laying about 100 eggs in the bark of the apple trees. The larvae hatch at the end of March or early in April; in very severe infestations sixty or more may be found in one blossom-cluster. If the trees are exposed to wind, they seldom suffer from this pest. The usual methods of control are described.

GASOW (H.). **Beitrag zur Bekämpfung des Weidenschädlings** *Phyllodecta vulgatissima*. [A Contribution to the Control of the Willow Pest, *P. vulgatissima*.]—*Arb. biol. Reichsanst.*, xv, no. 3, pp. 271–295, 5 graphs, 1 pl., 40 refs. Berlin, July 1927.

In August 1926 a local infestation of basket willows, *Salix viminalis* and *S. amygdalina*, by *Phyllodecta vulgatissima*, occurred in Westphalia. Early in August adults and a few eggs were present and towards the end of the month first-stage larvae were seen. The leaves were skeletonised, but usually only on one side. Various methods of control that have previously been recommended are mentioned, that of dusting with an insecticide being considered superior to others. In the present case the value of various dusts was investigated in a series of experiments. Arsenical preparations, particularly a proprietary form of Paris green, barium fluoride and other fluorine compounds proved the best. Sodium fluosilicate (Na_2SiF_6) was found to be excellent.

ZWÖLFER (W.). **Bericht über die Untersuchungen zur Biologie und Bekämpfung des Maiszünslers** (*Pyrausta nubilalis* **Hübn.) in Süddeutschland 1926.** [Report of Investigations on the Biology and Control of the Maize Borer, *P. nubilalis*, in South Germany in 1926.]—*Arb. biol. Reichsanst.*, xv, no. 3, pp. 355–400, 3 figs., 5 pls., 56 refs. Berlin, July 1927.

The maize borer, *Pyrausta nubilalis*, Hb., has been long established in Baden, where it occurs in all the maize-growing districts. Its seasonal occurrence corresponds with that in Ontario and is a month behind that in Hungary. Details of its biology in Baden are given. There is one generation a year. Pupation begins at the end of June, and the moths are on the wing and oviposit in July. The mature larvae hibernate, often in dried potato stalks. Two Hymenopterous parasites, *Microgaster tibialis*, Nees, and *Eulimneria crassifemur*, Thom., are of some value.

The average crop loss varies from 5 to 10 per cent. at a conservative estimate. At the flight-period fields rather thinly planted with normally developed plants present optimum conditions for *P. nubilalis*, fields planted very densely or abnormally sparsely suffering less.

The Noctuids, *Trachea* (*Hadena*) *basilinea*, F., and *Heliothis obsoleta*, F., also occur on maize and their larvae may be mistaken for those of *P. nubilalis*, but they are unimportant as pests.

HENGL (F.) & RECKENDORFER (P.). **Die Beurteilung des Schweinfurtergrüns für Pflanzenschutzzwecke.** [Methods of estimating the Qualities of Paris Green for Plant Protection Purposes.]—*Fortschr. Landw.*, ii, no. 21, pp. 686–693, 10 figs., 10 refs. Vienna, 1st November 1927.

Methods for the chemical analysis of Paris green and for determining its powers of suspension in water are described.

GOIDANICH (A.). **Coleotteri importati da navi.** [Beetles imported in Ships.]—*Boll. Soc. ent. ital.*, lix, no. 3, pp. 46–48, 11 refs. Genoa, 31st March 1927.

In April 1925 a shipment of 6,000 tons of soy-beans (*Glycine hispida*) was found on arrival at Hamburg to be infested by the Nitidulid, *Meligethes aeneus*, F., which issued in swarms after the holds had been opened. The beans had been loaded at Vladivostok and were from the Manchurian crop of the preceding summer. The larval mines resembled those of *Bruchus* spp. *M. aeneus* has not previously been recorded as attacking soy-beans.

KRIEG (H.). **Die Nonne im Kiefernwald.** [The Nun Moth in Pine Forests.]—*Forstarch.*, iii, no. 20, pp. 349–350. Hanover, 15th October 1927.

While mixed forests with an abundant undergrowth help to restrict the numbers of insect pests that are restricted to single species of trees, this does not apply to polyphagous ones such as the nun moth [*Lymantria monacha*]. In an infestation by this moth that occurred in 1927 in the district of Merseburg, Germany, where pines only were available for food, larval development had progressed much less than in places where beech and bilberry were available. In laboratory experiments all the larvae died that were fed on pine exclusively, while of those removed from pine and placed on hawthorn about 25 per cent. recovered and produced normal adults. The advantages offered by mixed stands as regards birds and insect parasites do not apply to the nun moth, because birds avoid it and its parasites are nearly all peculiar to it.

BLUNCK (H.) & HÄHNE (H.). **Der Stand der Rübenaaskäferfrage im Jahre 1926.** [The Position of the Beet Silphid Beetle Question in 1926.]—*Zuckerrübenbau*, 1927, no. 10, reprint 6 pp., 1 fig. Hanover, 1927.

This paper contains information on further work done in Pomerania [*cf. R.A.E.*, A, xi, 435; xiii, 395; xiv, 109]. *Blitophaga opaca*, L., was again predominant on beet, associated in one severe attack with *Silpha obscura*, L., and *B. undata*, Müller, occurred unexpectedly in various localities. Bremer's observations on the hibernation quarters [A, xv, 123] were confirmed. Rainy weather seems unfavourable, and many dead beetles were found during the wet winter of 1925–26.

Cultural measures cannot be relied upon against these pests, but early sowing is advisable and thinning should be deferred until larval feeding decreases. It is not practicable to combat the adults in their winter-quarters, nor are belts of baits or bait-plants around such quarters of any value. In small fields poultry are effective, but in large ones insecticides must be employed. The poisoning of belts of plants is unsatisfactory ; the fields must be treated as a whole. Sprays of Paris green adhere better than dusts, but are expensive, about 90 gals. to the acre being necessary. Several proprietary brands of arsenical dusts proved effective. A useful dusting bag is described and figured. It consists of a cylinder of canvas 8 ins. in diameter and 1 ft. deep, terminating at the bottom in a funnel pointing downwards, 3 ins. deep with an opening 2 ins. in diameter. This funnel is enclosed in a cylindrical chamber of loose-meshed material, 4 ins. deep, prolonging the canvas container. At the bottom this chamber is in turn prolonged by a protective cover of canvas about 3 ins. deep, weighted down by sand contained in a pocket.

HEYMONS (R.), V. LENGERKEN (H.) & BAYER (M.). **Studien über die Lebenserscheinungen der Silphini (Coleopt.). I.** *Silpha obscura* **L.** [Studies on the Bionomics of Silphini. I. *S. obscura.*]—*Z. Morph. Oekol. Tiere,* vi, no. 2, pp. 287–332, 14 figs., 41 refs. Berlin, 7th May 1926.

In view of the fact that various authors have recorded *Silpha obscura*, L., as a pest of beet, both in the adult and larval stages, extensive experiments were carried out on its food-preferences, the results of which show that the adults will feed on both animal and vegetable matter. They show a preference for dead animal matter, though they may eat living larvae and have even been observed to attack living larvae of their own species in the field. They were not found to feed on vegetable matter under natural conditions. The food of the larvae is similar ; under experimental conditions they readily attacked both vegetable and animal matter, no preference being observed.

The effects of animal, vegetable and mixed diets on both adults and and larvae are discussed. Fewer eggs were laid by females fed on a vegetable diet, while larvae fed on this diet developed rather more slowly and a number of first instar larvae died.

In captivity oviposition occurred from April to July and even occasionally in August. The eggs were laid in the soil at a depth of about $\frac{3}{4}$ in. and hatched in 7–9 days. The larval stage averaged 29 days, and the pupal stage 7 days. There is only one generation a year, the adults emerging in June–July. All stages of the insect were present in the field, near Berlin, as late as July, but by the middle of September they had all disappeared.

The morphology of the larva and pupa is described in detail.

HEYMONS (R.), v. LENGERKEN (H.) & BAYER (M.). **Studien über die Lebenserscheinungen der Silphini (Coleopt.). II.** *Phosphuga atrata*, **L.** [Studies on the Bionomics of Silphini. II. *P. atrata*, L.] —*Z. Morph. Oekol. Tiere*, ix, no. 1–2, pp. 271–312, 11 figs., 2 pp. refs. Berlin, 1927.

This is a detailed account of the biology, ecology and morphology of *Phosphuga atrata*, L. Observations clearly show that the larvae and adults normally feed on snails. Under experimental conditions the larvae would also feed on meat, but they could not be induced to feed on any form of vegetation. These results confirm the observations of Friederichs [*R.A.E.*, A, ix, 610] that this species has been confused with *S. obscura*, L., and as such erroneously recorded as a pest of beet.

ABDERHALDEN, **Handbuch der biologischen Arbeitsmethoden. Abt. ix. Methoden zur Erforschung der Leistungen des tierischen Organismus.** [Section ix. Technique for investigating the Behaviour of the Animal Organism.]—Berlin, Urban & Schwarzenberg.

The following papers deal with the rearing of insects in the open and in the laboratory: HEIKERTINGER, The determination of the food-plants of insects, Teil 1, pp. 433–438 (in Lieferung 71), General notes on the rearing of insects, Teil 1, 2. Hälfte, pp. 25–80; PRZIBRAM, Apterogenea, pp. 81–86; ZACHER, Orthoptera, pp. 89–190; HEIKERTINGER, Corrodentia pp. 191–200, Rhynchota (Hem. Heteropt.) pp. 201–214 (all in Lieferung 182); BÖRNER, Homoptera, pp. 215–270; HEIKERTINGER, Neuroptera, Trichoptera and Mecoptera, pp. 271–275; FISCHER, Lepidoptera, pp. 277–356; HEIKERTINGER, Diptera, pp. 357–398, Coleoptera, pp. 399–458; FAHRINGER, Hymenoptera, pp. 459–484 (all in Lieferung 204); KUTTER, Ants, pp. 485–512; HARTMANN, Honey-bee, pp. 513–536; and MICHAEL, *Bombyx mori*, pp. 537–556 (all in Lieferung 207).

PETERSEN (W.). **Die Blattminierergattungen** *Lithocolletis* **u.** *Nepticula* **(Lep.).** [The Leaf-mining Genera *Lithocolletis* and *Nepticula* (Lep.).] **Part I.** *Lithocolletis*, **Z.**—*Stettin. ent. Ztg.*, lxxxviii, pt. 2, pp. 113–174, 68 figs. Stettin, 1927.

The object of these investigations was to ascertain the value of the genital organs in the classification of species of *Lithocolletis* and *Nepticula* and to discover whether the feeding-habits of the larvae would throw any light on the origin of the species. The sexual armature, particularly of the males of *Lithocolletis*, is very characteristic. Of the 100 species of the palaearctic fauna, 68 are here described and illustrated. Observations on the association of feeding-habits of these genera and the characters of *Nepticula* are not yet complete.

STELLWAAG (F.). **Die Weinbauinsekten der Kulturländer.** [The Insects injurious to the Grape Vine and its Products in Civilised Countries.] —8vo, viii+884 pp., 579 figs. Berlin, P. Parey, 1928. Price, cloth *M*.50.

This work is a very comprehensive epitome of the knowledge of the insect pests found in vineyards, wine cellars and dried raisin stores throughout the world. In the general section the ecology of insects in the vineyard is considered, the reasons for an increase of a particular species being discussed. The economic value of control measures is then indicated, and the principles of chemical methods are dealt with, special attention being paid to arsenicals, though contact insecticides are also discussed, and notes are given on spraying machinery. Considerable space is devoted to biological control.

The specific part of the work, covering 740 pages, deals with about five hundred species of insects and mites from all parts of the world, extensive bibliographies being given. The chief pests, such as *Phylloxera vastatrix* and *Clysia ambiguella*, are treated very fully. A polyglot index to the species mentioned is appended.

Krankheiten und Beschädigungen der Kulturpflanzen [Diseases and Injuries of cultivated Plants] **im Juli, August, September 1927.**] *NachrBl. deuts. PflSchDienst.*, vii, nos. 9–11, pp. 92–94, 101–104, 111–113. Berlin, September–November 1927.

These monthly reports contain annotated lists of the insect pests recorded in Germany during the period under review, arranged according to the class of crop attacked.

[Shchegolev (V. N.).] **Щеголев (B. H.). The Wheat-stem Sawfly,** *Cephus pygmaeus*, **L., and the Black Sawfly,** *Trachelus tabidus*, **F.** [*In Russian.*]—*Byull. Rostov-Nakhich. sel.-khoz. op. Stantz.* [*Bull. Rostov-Nakhichevan Agric. Expt. Sta.*], no. 207, 8 pp., 11 refs. [Rostov] 1926.

Observations in 1925 on the sawflies, *Cephus pygmaeus*, L., and *Trachelus tabidus*, F., in the Stavropol region show that the former mainly attacks autumn-sown wheat, while *T. tabidus* is chiefly a pest of spring-sown wheat and barley. This is due to the condition of the crop at the time of the occurrence of the sawflies, autumn-sown wheat being at a suitable stage of development for attack when *C. pygmaeus* appears in the field, but too far advanced for attack when *T. tabidus* appears. It is suggested that the predominance of either species in any locality is related to the type of crop mostly grown, *i.e.*, whether autumn- or spring-sown.

The main characteristics of the larvae of these two species are described [*cf. R.A.E.*, A, xv, 234].

[Shchegolev (V. N.).] **Щеголев (B. H.). Grain Sawflies. (Ecology and Control Experiments.)** [*In Russian.*]—*Byull. Rost.-Nakhich. sel.-khoz. op. Stantz.* [*Bull. Rostov-Nakhichevan Agric. Expt. Sta.*], no. 228, 74 pp., 16 figs., 31 refs. Rostov, 1927.

This is a more detailed and extensive account of the ecology of *Cephus pygmaeus*, L., and *Trachelus tabidus*, F., including the results of observations in various localities of the northern Caucasus [see preceding paper]. The bionomics are briefly discussed [*cf. R.A.E.*, A, xiv, 280]. The plants frequented by the adults belong to 8 different families, but in all cases have flowers showing some combination of yellow and blue colouring. Tall thick-stemmed plants are preferred for oviposition, as are also those that are in the ear-forming stage. In testing the possible resistance of different varieties of wheat, barley, rye and oats (the last-named attacked almost exclusively by *T. tabidus*), a definite relation was found to exist between the period of ear-formation and the attack by the sawflies. The actual variety of the plant does not appear to have any influence ; only one variety of wheat (having a solid straw) was practically immune. The time of sowing and the density also affect the amount of infestation by influencing the condition of the crop at the time of the flight of the sawflies. The more sparsely grown plants have thicker, stronger stems and are therefore preferred for oviposition. The eggs hatch in 5–6 days.

It has been suggested that infested grain crops should be harvested before the larvae descend to the part of the stem that will remain as stubble in the field. It is not advisable, however, to harvest these crops before they turn yellow, and by that time most of the larvae will have descended to the stubble.

Preliminary experiments were made with a view to ascertaining whether the larvae could be killed by burning the stubble. Under favourable conditions 70–80 per cent. of the larvae were thus destroyed, but the method should be tested under local conditions. Its efficacy depends on such factors as the dryness of the soil and stubble and the density of the latter, and on weather conditions. The spreading of straw amongst the stubble increases the efficacy of this method, 400 lb. to the acre being sufficient unless many weeds are present. The burning is best done about 7–10 days after harvest, before weeds and self-sown grain have come up.

[OGLOBLIN (D. A.) & KOLOBOVA (A. N.).] **Оглоблин (Д. А.) и Колобова (А. Н.). Tenebrionidae and their Larvae injurious to Field Crops.** [*In Russian.*]—Trud. Poltavsk. sel.-khoz. op. Stantz. [*Trans. Poltava Agric. Expt. Sta.*], no. 61, Ent. Div. xv, 60 pp., 44 figs., numerous refs. Poltava, 1927.

A general account of the life-history and habits of Tenebrionids is compiled from information obtained in various parts of the world, as well as from personal observations both under natural and artificial conditions in Ukraine [*R.A.E.*, A., xiii, 447]. Keys are given to the genera and species of the adults, chiefly from Ukraine, with notes on their distribution elsewhere, and to the species of the larvae and the pupae, with detailed descriptions of the injurious species.

The economic importance of Tenebrionids is briefly discussed, the most satisfactory measures for their control being crop rotation and other cultural practices. The treatment of the seed with kerosene and tar or similar substances has given negative results, as in America. Seeds wetted with a solution of starch paste and then rolled in Paris green were usually left untouched by the larvae, and the few that did attack them were poisoned. This treatment does not affect the germination of the seed.

During 1924 the Tachinid, *Stomatomyia acuminata*, Rond., was reared from the larvae of *Blaps halophila*, Fisch., *Platyscelis gages*, Fisch., *Pedinus femoralis*, L., and *Opatrum sabulosum*, L., the only species that were abundant during that year. There were five generations in the year, each of which destroyed about 20 per cent. of the Tenebrionid larvae. In Poltava the first adults of the parasite were noticed at the beginning of May, occurring in large numbers in the maize and beet fields ; the succeeding generations appeared at intervals of about a month until September. The eggs are laid on any part of the host larva, when the latter appears near the surface; they have also been found occasionally on the adults, in which case the larvae of the parasite are unable to develop as they cannot penetrate the integument. The eggs hatch in 4–5 days, and the larvae eat their way into the host. Pupation occurs in the soil. Several individuals of the parasite may develop in one host larva. The larval stage lasts 9–10 days, and the pupal stage 6–10, hibernation occurring in the larval stage inside the host.

TAYLOR (J. S.). **A Note on Some South African Lepidoptera of Economic Importance with especial reference to the Eastern Transvaal.**—*Ent. Rec.*, xxxix, no. 10, pp. 141–144, 2 refs. London, October 1927.

Cosmophila auragoides, Guen., is probably the most important of the minor pests of cotton in the Eastern Transvaal; it caused considerable damage in 1925–26, but was comparatively scarce in 1926–27, probably owing to the activities of Chalcid and Tachinid parasites. The larvae feed on the leaves, and pupation occurs in a loose cocoon among the leaves or bracts. *Xanthodes graellsi*, Feisth., also feeds on the leaves and was more abundant than *C. auragoides* during 1926–27. Pupation occurs in an earthern cocoon in the soil; in the summer the adults emerge after a pupal period of about 18 days. Hibernation occurs in the larval stage within the cocoon. A Tachinid has been reared from the larvae. Another Noctuid, *Tarache nitidula*, F., has similar habits.

In January 1927 *Laphygma exigua*, Hb., was found attacking cotton foliage, the larvae forming webs on the lower surface of the leaves. Pupation occurred in the soil, the adults emerging after about 18 days. The larvae were parasitised by a Braconid. Outbreaks of *L. exempta*, Wlk., occur every few years; it was abundant during the past season [*R.A.E.*, A, xv, 328], but did not attack cotton. Two Ichneumonid parasites have been reared from the larvae.

Argyroploce leucotreta, Meyr. (false codling moth) is the most important pest of *Citrus* [*R.A.E.*, A, ix, 442]. Besides the usual measures such as clean cultivation and disposal of dropped fruit, experiments with sweetened arsenical baits and bait-sprays for the control of the adults are being carried out. *Papilio demodocus*, Esp. (*demoleus*, auctt.) is common throughout the country, but is a less serious pest of *Citrus*. The eggs are laid on the young shoots and leaves, on which the larvae feed. Pupation occurs on the trees or on neighbouring plants. Young trees may be entirely defoliated, but older trees are not usually seriously affected.

Sphingomorpha chlorea, Cram., causes considerable losses to *Citrus* and other fruits. It may be controlled by fermented baits [*R.A.E.*, A, xi, 570].

HARGREAVES (H.). **Annual Report of the Government Entomologist.**—*Rep. Dept. Agric. Uganda 1926*, pp. 24–27. Entebbe, 1927.

In cross-breeding experiments with the small and large spotted forms of *Antestia* the eggs proved infertile, thus indicating that there are two species of this Pentatomid attacking coffee in Uganda. In addition to the parasites mentioned in the last report [*R.A.E.*, A, xiv, 553], a species of *Pleurotropis*, which is probably a hyperparasite, has been bred from the eggs. In January, *Asterolecanium hancocki*, Laing (MS.), was found to be heavily parasitised. Coffee trees lightly infested with this scale died, but examination of their roots revealed the presence of a fungus, thus confirming the view that the scale was not the primary cause of death. On examination 50 per cent. of the coffee trees treated in 1925 with 2½ oz. paradichlorobenzene proved to be free from *Pseudococcus lilacinus*, Ckll. (previously recorded as *P. citri*, Risso and *P. coffeae*, Newst. [*R.A.E.*, A, xiv, 553]). It is apparently necessary with large trees to bare the roots within a circle of three feet in diameter and to apply 3 oz. of the insecticide, but with smaller trees the dosage should be reduced according to age. *Bixadus sierricola*, White, was prevalent in two localities near forest, and it seems probable that forests act as reservoirs for the pest, which migrates to coffee. Other insects observed on coffee were: *Megalognatha rufiventris*, Baly; *Metadrepana glauca*, Hmpsn.; *Stephanoderes hampei*, Ferr.; *Icerya* sp., attacked by a Chalcid parasite and by the Coccinellid, *Novius ferrugineus*, Weise; *Coccus* (*Lecanium*) *africanus*, Newst.; and the Halticid, *Jamesonia* sp., eating the pedicels of the berries.

Sesamia vuteria, Stoll, recorded for the first time from Uganda, is a pest of sugar-cane and has been observed on maize. The larvae bore into the furled leaves of the cane near the apical bud and feed on the young leaves, causing the condition known as "dead heart." Approximately 2 per cent. of ratooned and seedling canes were killed; the older canes were not attacked. The moth was satisfactorily controlled by cutting out and destroying the "dead hearts" containing the caterpillars; an unidentified Tachinid parasite was reared from the larvae. *Trionymus* (*Pseudococcus*) *sacchari*, Ckll., which is a very minor pest, shows a marked preference for cane rendered unhealthy by other factors. Termites destroyed the rhizomes of sugar-cane in two comparatively small areas, but a species of *Fusarium* isolated from the roots was probably the primary cause of the damage. Slight injury was caused to tea leaves by the Capsid, *Helopeltis bergrothi*, Reut., and a small red mite. *Cylas compressus*, Hartm., was a minor pest of sweet potato; the larvae were externally parasitised by an unidentified Braconid.

Other pests were: *Cosmopolites sordidus*, Germ., on banana; *Busseola fusca*, Fuller, on maize; *Laspeyresia ptychora*, Meyr., on *Cajanus indicus*; a sawfly (*Athalia* sp.) attacking the leaves of turnip, many plants being completely defoliated, and the Pyralid, *Hellula undalis*, F., which bored into the tap-roots; another Pyralid, *Rhodochrysea superbella*, Hmps., boring into the tap-roots of carrot; the fruit-flies, *Dacus brevistylus*, Bezzi, and *D. vertebratus*, Bezzi, attacking imported varieties of marrow; the Platypid, *Crossotarsus excavatus*, Samps., boring in stems of *Albizzia* sp.; the Scolytid, *Hypothenemus eruditus*, Westw., in diseased branches of *Cedrela toona*; *Heliothis obsoleta*, F. (*Chloridea armigera*, Hb.) eating buds of carnation (*Dianthus caryophyllus*); the Noctuid, *Brithys pancratii*, Cyr., attacking various species of lilies and destroying both bulbs and leaves; and the Galerucid, *Asbecesta cyanipennis*, Har., eating the leaves of *Sesamum indicum*.

The Bostrychid, *Dinoderus pilifrons*, Lesne, was intercepted in bamboo from India, the Anthribid, *Araecerus fasciculatus*, DeG., in seed of *Guarea thompsoni* from Nigeria, and the Tineid, *Setomorpha rutella*, Zell., in bulbs from Seychelles.

HANCOCK (G. L. R.). **Annual Report of the Assistant Entomologist.**—*Rep. Dept. Agric. Uganda 1926*, pp. 27–29. Entebbe, 1927.

The bollworms that attack cotton in Uganda are *Earias insulana*, Boisd., *E. biplaga*, Wlk. (the latter being the more abundant), *Heliothis obsoleta*, F., and *Argyroploce leucotreta*, Meyr., which is the reddish species referred to in a previous report [*R.A.E.*, A, xiv, 554]. *Pyroderces coriacella*, Snell., which occurs in decaying bolls, appears to be merely a scavenger. Damage by the first three species mentioned has been more noticeable in the early part of the season, buds and young bolls being destroyed; in some areas as many as 40 per cent. of the young and mature bolls of the first crop have been damaged by *Earias* spp. The only parasite recorded is an external Braconid parasite of *E. biplaga*, which is, apparently, not unlike *Microbracon lefroyi*, D. & G. Bollworms are largely responsible for the introduction of internal boll rot, although sucking insects such as *Dysdercus* have been responsible for some damage. Damage to leaf buds by *Earias* is also common.

Four species of *Dysdercus* have been found on cotton, *D. superstitiosus*, F., also found on *Hibiscus* spp. and *Abutilon indicum*, *D. fasciatus*, Sign., *D. nigrofasciatus*, Stål, and one other species [since identified as *D. cardinalis*, Gerst.]; previous records of *D. pretiosus*, Dist., attacking cotton [*loc. cit.*] require confirmation. *D. fasciatus* was found on cotton seed at some ginneries at the time when the new crop was coming into flower, and it is therefore probable that the numbers of stainers could be reduced by burning or efficiently storing all cotton seed after the distribution of the seed for the following crop. With a few exceptions no appreciable number of stainers was found during the month when the new crop was being planted. In one cotton plot *Dysdercus* spp. were found on various weeds, owing apparently to the cotton being too dry. In another instance both adults and nymphs of *D. nigrofasciatus* were found on a species of *Vernonia* at the edge of a cotton plot, and not on the cotton. Observations in the laboratory indicate that the rate of reproduction of *D. fasciatus* and *D. nigrofasciatus* is much slower if they are supplied with green bolls alone than if cotton seed is also supplied. The total length of the life-cycle of *D. nigrofasciatus* when provided with both bolls and seeds was on an average 55 days. A long cotton planting season favours the multiplication of pests, and the fact that stainers may be expected to multiply more rapidly when one plot is producing seed is an additional reason for discouraging early planting. Experiments have shown that *D. nigrofasciatus* can introduce bacteria into the cotton bolls.

Serious damage is caused by two species of *Helopeltis*, *H. bergrothi*, Reut., and probably *H. sanguineus*, Popp., which suck the young shoots and leaves, the whole plant becoming so stunted that it is rare for any bolls to be formed; occasionally when the plant is attacked in an early stage of growth it may recover and produce a small crop. These insects usually confine their attacks to one plant, neighbouring plants being untouched. Eggs are laid in a slit in the leaf petiole. Plants attacked often seem to show more "angular leaf spot" and "black arm," and it is possible that *Helopeltis* may spread these.

Minor pests of cotton include: the Jassid, *Empoasca facialis*, Jac.; an Aphid [*Aphis gossypii*, Glov.], which is attacked by *Paragus borbonicus*, Macq., and *Syrphus adligatus*, Wied., the former being parasitised by the Ichneumonid, *Bassus laetatorius*, F., while a species of *Syrphoctonus* has been bred from the latter; and *Euxoa segetum*, Schiff., which only caused serious damage to seedlings in one locality, where it destroyed 11 per cent. The following caterpillars have been observed on the leaves, but caused only slight damage: *Arctornis rubricosta*, Fawcett; *Xanthodes graellsi*, Feisth.; *Cosmophila flava*, F.; the leaf-miner, *Acrocercops bifasciata*, Wlsm.; and the leaf-roller, *Sylepta derogata*, F., which caused considerable damage to one plot planted before the normal planting season. Many of the larvae of *S. derogata* were parasitised by a Braconid, *Apanteles xanthostigmus*, Hal. Termites, *Ancistrotermes* sp., and the root aphis, *Geoica* sp., caused some damage to the roots, while a species of mealybug was also found feeding on them; damage by *Syagrus calcaratus*, F., was negligible.

Most of the information concerning *Platyedra erebodoxa*, Meyr., has already been noticed [*R.A.E.*, A, xv, 560]. The three parasites of this moth belong to the genera *Microbracon*, *Chelonus* and *Apanteles*. The last is unfortunately itself heavily parasitised, but hyperparasites infesting *Microbracon* are rare, and *Chelonus* appears to be free from attack. There are still no records of the true pink bollworm, *P. gossypiella*, Saund., from Uganda.

MAYNÉ [R.]. **Quelques Longicornes nuisibles aux plantations.**—*Rev. zool. afr.*, xv, Bull. Cercle zool. Congol., pp. [43]–[44]. [Brussels] 15th September 1927.

Longicorns recorded as injurious in the Belgian Congo are the Prionids, *Stenodontes downesi*, Hope, which oviposits in diseased parts of cassava and *Hevea*, causing considerable damage, and *Macrotoma palmata*, F., the larvae of which tunnel in the trunks of *Citrus*; and the Lamiids, *Anthores leuconotus*, Pasc., and *Bixadus sierricola*, White, both of which are of widespread occurrence in the Congo and in East Africa, the larvae infesting coffee, and *Petrognatha gigas*, F., var. *spinosa*, Kolbe, attacking *Castilloa*. *A. leuconotus* prefers *Coffea arabica*, the adult ovipositing in the dry season in the collar; the larva tunnels in the trunk and finally cuts through the tap-root so that the bush falls over at the first gust of wind. *B. sierricola* attacks all varieties of coffee, but is less dangerous than *A. leuconotus*; oviposition occurs halfway up the trunk, and the larva enters at that level.

GHESQUIÈRE (J.). **La maladie du Bananier au Congo belge.**—*Rev. zool. afr.*, xv, Bull. Cercle zool. Congol., pp. [59]–[68], 1 fig., 17 refs. [Brussels] 15th September 1927.

The information contained in this paper respecting *Cosmopolites sordidus*, Germ., attacking bananas has been noticed from other sources [*R.A.E.*, A, xiii, 109; xv, 24].

ANSON (R. R.). **Report by [the] Cotton Specialist.**—*Rep. Dept. Agric. Fiji 1926*, pp. 11–16. Suva, 1927.

In the paragraph dealing with insect pests and diseases of cotton, *Platyedra* (*Gelechia*) *gossypiella*, Saund., is mentioned as causing only slight damage, though in some cases the last pickings were badly infested; a continuation of the practice of sunning the seed on iron sheets before redistributing it to growers is recommended. The attacks of *Earias fabia*, Cram. (tip worm) were most noticeable in

December and February, the decrease in the intervening period possibly being due to the activities of the hornet [*Polistes hebraeus*, F.]. *Dysdercus sidae*, Montr. (cotton stainer) was a serious pest during the latter part of the season ; unfortunately there are many indigenous shrubs and grasses on which it passes the time from one season to the next. *Tectocoris lineola*, F. (harlequin bug), which is confined mostly to coastal areas, survives this period on *Thespesia populnea*.

MAGEE (C. J. P.). **Investigation on the Bunchy Top Disease of the Banana.**—*Bull. Council Sci. Ind. Res.*, no. 30, 64 pp., 22 pls., 10 refs. Melbourne, 1927.

This is the final report of the Bunchy Top Investigation Committee [*R.A.E.*, A, xiv, 95], a review of which has already been noticed [xv, 216]. The history of the disease in Australia is traced and the symptoms and degree of susceptibility of the different varieties of *Musa* are discussed. Experiments are described proving that the banana aphis, *Pentalonia nigronervosa*, Coq., transmits the disease, which is in all probability a virus infection. The Aphids are found chiefly around the base of the pseudostem of the banana at soil level and for several inches below the soil surface, between the sheath of the outer leaf and pseudostem, and on young suckers just emerging from the ground. Although generally occurring on the most sheltered and inaccessible parts of the plant, they have never been found on the roots. They are most numerous in wet seasons and decrease rapidly in a drought. Both winged and wingless Aphids occur in a normal colony, the latter being by far the more abundant. Their food is apparently limited to species of *Musa*. Dissemination occurs by flight, wind, contact of foliage or crawling of Aphids, transportation of infested suckers (probably the most important method of extension to new areas) or of infested soil, and the carrying of Aphids on workers' clothes. Experiments demonstrated that the Aphids retain their infectivity for some time, but healthy trees were apparently unaffected by the inoculation of the body juices of infective Aphids, and the manner of transmission is not definitely known.

Measures recommended for the exclusion of the disease from healthy areas are the prohibition of transporting any part of a plant of the genus *Musa* from an infected area or to a fresh part of that area, or of trading in suckers without a permit from a competent authority ; the registration of all areas in which *Musa* spp. are cultivated in Queensland or New South Wales, and the notification of the disease when discovered ; the destruction of any banana plants in unregistered places, and the immediate destruction in all lightly infected areas of any stool showing infection ; the systematic inspection by growers of all stools in plantations lightly or newly infected or uninfected, and regular surveys of plantations by competent inspectors ; and the distribution of knowledge concerning the disease. The eradication of all infected stools offers the best solution of dealing with the disease, and this can only be accomplished by the cleaning up of all deserted plantations and of infected ones that are still being worked, the destruction of all banana plants in small gardens, the enforcement of penalties for harbouring infected stools, and the discouragement of further planting in heavily infected areas until the whole area is certified as clean. It is suggested that twelve months after the date of adoption of eradication measures, the question of complete destruction of all banana plants in infected areas should be considered, and that future plantings should be only with certified healthy suckers.

HUDSON (G. V.). **The Giant Ichneumon-fly,** *Rhyssa fractinervis* **Voll. A further Contribution towards its Life-history.**—*N.Z. J. Sci. Tech.*, ix, no. 2, p. 118. Wellington, N.Z., July 1927.

Rhyssa fractinervis, Voll., has been taken emerging from a burrow of a weevil, *Rhynchodes ursus*, White, in a dead beech tree (*Nothofagus*). With the material now available, it is hoped that this Ichneumonid may be reared from the larva of *R. ursus* in captivity.

[LEGISLATION :] **Importação de plantas, sementes, frutas, etc.** [The Importation of Plants, Seeds, Fruits, etc., into Brazil.]—*Bol. Agric.*, xxviii, no. 6–7, p. 367. S. Paulo, June–July 1927.

Living plants or living parts of plants may be imported into Brazil only through the ports of Belém, Recife, São Salvador, Rio de Janeiro, S. Francisco, Santos, Rio Grande, Porto Alegre, and Corumbá, and they must be accompanied by a certificate issued by the official plant inspection service of the country of origin.

Medical Report of the Hamilton Rice Seventh Expedition to the Amazon, in Conjunction with the Department of Tropical Medicine of Harvard University, 1924-1925.—*Contr. Harvard Inst. Trop. Biol. Med.*, no. iv, xvi+313 pp., 70 pls., 16 figs., num. refs. Cambridge, Mass., 1926. [Recd. 1927.]

A review of this report has already been published [*R.A.E.*, B, xv, 196]. In part II, J. Bequaert gives notes on the termites of the Amazon region [*R.A.E.*, A, xiv, 84] and records the midge, *Cecidomyia manihot*, Felt, as forming galls on the leaves of cassava (*Manihot utilissima*). Felt's description of the midge is given, and descriptions and drawings of the galls are included. They are always on the upper surface of the leaf. When the larva is fully grown, it occupies the upper part of the gall cavity and spins a transverse partition separating it from the lower part and then pupates, the adult escaping by a large opening at the point of attachment of the gall. Two or more galls are frequently fused and sometimes they are so numerous as to cover the entire leaf surface. This midge is probably the most dangerous insect pest of cassava in South America, but as pupation occurs inside the gall it should be easy to exterminate it by collecting and destroying all galls as soon as they appear on the leaves. The larvae are parasitised by at least two species of Chalcids. A complete review of the bibliography of these midges is appended.

RUSSO (G.). **Dominican Republic : Chief Insects harmful to Crops.**—*Int. Bull. Pl. Prot.*, i, no. 7, pp. 108–110. Rome, August 1927.

Pests of *Citrus* in San Domingo include *Chrysomphalus ficus*, Ashm. (*aonidum*, auct.), of which *Aspidiotiphagus lounsburyi*, Berl. & Paoli, is the most important parasite ; *Selenaspidus articulatus*, Morg. ; *Chionaspis citri*, Comst. ; *Lepidosaphes pinnaeformis*, Bch. ; *Saissetia oleae*, Bern. ; and the weevil, *Diaprepes abbreviatus*, L. (*spengleri*, L.).

Pests of maize, both field and stored, cause an estimated loss of 50 per cent. of the crop. They include *Laphygma frugiperda*, S. & A., *Heliothis* (*Chloridea*) *obsoleta*, F., *Calandra oryzae*, L., and *Sitotroga cerealella*, Oliv.

Other pests additional to some already noticed [*R.A.E.*, A, xvi, 17] include *Pulvinaria pyriformis*, Ckll., and *Aspidiotus destructor*, Sign., on avocado ; *Vinsonia stellifera*, Westw., on mango ; *Diatraea saccharalis*, F., and *Trionymus* (*Pseudococcus*) *sacchari*, Ckll., on sugar-cane ; *Leucoptera coffeella*, Gn., on coffee ; *Aspidiotus destructor*, Sign., and *Homaledra sabulella*, Chambers, on coconut ; *Plutella maculipennis*, Curt., on cabbage ; *Epitrix cucumeris*, Harr., on egg-plants ; *Protoparce sexta*, Joh., on tomatos ; and *P. sexta* and *Epitrix parvula*, F., on tobacco.

RUSSO (G.). **Informe de la Seccion de Entomologia.** [Report of the Entomological Section.]—*Repub. Dominicana : Estac. nac. agron. de Moca, Lab. Entom.*, 35 pp. Santo Domingo, R.D., 1927.

The following pests are additional to those mentioned in the preceding paper : *Ischnaspis longirostris*, Sign., and *Vinsonia stellifera*, Westw., on coconut ; *Orthezia insignis* and *Saissetia coffeae*, Wlk. (*hemisphaerica*, Targ.), on egg-plant ; *Brevicoryne brassicae*, L., on cabbage ; and *Cylas formicarius*, F., on sweet potato. *Calandra oryzae*, L., and *Tribolium ferrugineum*, F., occur in granaries.

An account is given of various recorded successes in biological control, with notes on artificial measures and plant protection quarantines, and a list of beneficial insects of which the importation is planned.

D[AMPF] (A.). **El gusano medidor del maiz.** [The Maize Looper.]—*Bol. mens. Defensa agric., Sec. Agric. Fomento, Mexico*, i, no. 3, pp. 209–210. S. Jacinto, D.F., July–August 1927.

The Noctuid, *Remigia punctularis*, Hb. (*Mocis repanda*, auct.) is reported as doing serious injury to maize in the state of Veracruz, Mexico. The caterpillars should be collected by hand, the maize sprayed with 2½ lb. lead arsenate and 1 lb. casein in 100 gals. water, and trap-trenches dug to prevent the caterpillars from migrating.

SHAMBLIN (A. J.). **Eradication and Control of Date Scale.**—*Rept. 1st Date Growers' Inst.*, pp. 13–14. Coachella, Cal., April 1924. [Recd. 1927.]

An account is given of the various control measures used against *Parlatoria* [*blanchardi*, Targ.] since its introduction into the United States in 1890, when date palms were first imported into Arizona from Algeria and Egypt. The gas torch method [*R.A.E.*, A, xv, 593] has been successfully used against the scale in Arizona since 1905, and subsequently in California. Small offshoots have in most cases been cleaned by fumigation under galvanised tanks, using 1 oz. sodium cyanide to 100 cu. ft., the use of the torch being necessary only where shoots are heavily infested. The concentration of imported offshoots in quarantine nurseries for inspection and treatment, begun in 1914–15 and continued in 1920–22, made it possible to check the spread of the scale from this source.

Marlatt's scale [*Phoenicococcus marlatti*, Ckll.] was completely eradicated together with *Parlatoria blanchardi* on the original imported date palms at Phoenix, Arizona, in 1905 by severe burning with the gas torch after close pruning of old leaf stubs and fibre, but the author has not seen any other instance of the complete eradication of this scale; he recommends spraying with a tar distillate emulsion at least four times a year. *P. marlatti* was found to be controlled by extreme heat, the scale on the foliage being entirely killed off in 1917 when the shade temperature rose to 123·5° F. Deep setting of offshoots in basins and frequent irrigations also tend to keep the scale in check, probably by the action of the water or of the silt that fills in the spaces behind the leaf-bases. The necessity for drastic Federal and State quarantine regulations is urged.

STICKNEY (F.). U.S. Bur. Ent. **Date Palm Insects.**—*Rept. 1st Date Growers' Inst.*, pp. 16–17. Coachella, Cal., April 1924. [Recd. 1927.]

Three insects and a mite, each of which was originally imported from the Old World, attack the growing tissue of the date palm [*Phoenix dactylifera*] in California, *viz.*, *Parlatoria blanchardi*, Targ., which is the most serious pest; *Phoenicococcus marlatti*, Ckll. (Marlatt's scale), which has hitherto only been found on date and [*Phoenix*] *canariensis*, and which cannot survive heat and drought except when situated behind the fibre and does most damage to small offshoots and fruit stalks; *Paratetranychus heteronychus*, Ewing, which becomes abundant in June on the green fruit and will ruin entire bunches if left undisturbed [*R.A.E.*, A, xv, 593]; and the Fulgorid, *Asarcopus palmarum*, Horv. (date bug), which attacks principally that part of the crown leaves below the fibre line and the bases of the season's fruit stems, exuding a transparent sticky substance, and weakening or killing small or weakly palms. None of these pests passes through a dormant period, cooler weather merely slackening their activities.

Paratetranychus heteronychus, Ewing, which also occurs on some other palms and on various grasses, passes its entire life-cycle within or about the edges of its web; it is little in evidence except when on the fruit, but develops throughout the year on the younger leaves behind the fibre. It is easily controlled during the season by nicotine-sulphur dust or a tar distillate emulsion. A nicotine-soap spray has been employed successfully against *Asarcopus palmarum*.

The most important insects attacking the ripe dates in California are *Carpophilus hemipterus*, L. (fig beetle), which attacks them as soon as they mature, showing a preference for sour fruit, and breeds slowly throughout the winter in dates left rotting in the soil; *Silvanus* (*Oryzaephilus*) *surinamensis*, L. (saw-toothed grain beetle), which attacks the partly dried fruit, great difficulty being experienced in keeping it from the stored product; and *Plodia interpunctella*, Hb. (Indian meal moth), which breeds in dates at all stages, the larvae sometimes beginning to infest the fruit before it is picked and spinning a sticky web wherever they crawl. *P. interpunctella* is the only important pest of the date palm that appears to hibernate; it passes most of the winter in the larval stage. These three pests are controlled in the larger packing houses by fumigation with carbon bisulphide, but screening boxes, doors and windows, with screens of 36 or more meshes to the inch, immediately after packing the fruit, would be of great assistance in preventing them from obtaining access to it.

CARTER (W.). U.S. Bur. Ent. **A Technic for the Use with Homopterous Vectors of Plant Disease, with special Reference to the Sugar-beet Leaf Hopper,** *Eutettix tenellus* **(Baker).**—*J. Agric. Res.*, xxxiv, no. 5, pp. 449–451, 1 fig. Washington, D.C., 1st March 1927.

Various membranes have been tried in feeding experiments with *Eutettix tenella*, Baker. The most satisfactory results were obtained by using animal mesentery, which may either be stretched over a hollow cork or used as a bag to contain the food. By this method, the application of which is described, it has been possible to transmit curly-top disease from the juice of diseased beets to non-infective leafhoppers and from them to healthy beets. This technique should greatly simplify nutrition studies with sucking insects, as the quality of the food can be fairly accurately controlled. It may also be used in connection with an apparatus for maintaining controlled temperatures.

CUSHMAN (R. A.). U.S. Bur. Ent. **New Species and new Forms of Ichneumonidae parasitic upon the Gipsy-moth Parasite,** *Apanteles melanoscelus* **(Ratzeburg).**—*J. Agric. Res.*, xxxiv, no. 5, pp. 453–458, 2 refs. Washington, D.C., 1st March 1927.

Apanteles melanoscelus, Ratz., is one of the most important parasites of the gipsy moth [*Porthetria dispar*, L.] in the United States, but its efficacy is reduced by a number of hyperparasites, some of which are here described. They are *Gelis bucculatricis*, Ashm., and *G. urbanus*, Brues, and the new species, *G. apantelis*, *G. inutilis*, *G. nocuus*, and *Hemiteles apantelis*.

SIMMONS (P.) & ELLINGTON (G. W.). U.S. Bur. Ent. **Dispersion of the Angoumois Grain Moth to Wheat Fields.**—*J. Agric. Res.*, xxxiv, no. 5, pp. 459–471, 5 refs. Washington, D.C., 1st March 1927.

Sitotroga cerealella, Oliv. (Angoumois grain moth), unlike most pests of stored wheat, attacks the crop before it is harvested. It passes the winter in the immature stages in stored grain, the moths ovipositing on the maturing wheat in the fields [*R.A.E.*, A, vi, 202]. Data collected in Maryland and in south-eastern Pennsylvania indicate that ear maize, wheat in straw, and litter from it, and bins are the principal sources of field infestation, and that the percentage of infestation decreases as the distance from such sources increases. An infestation of 0·26 per cent. in the field indicates a moth population of 28,500 to the acre, and owing to the rapidity with which *S. cerealella* increases under favourable weather conditions [*cf.* *R.A.E.*, A, xiii, 335] these infestations may develop into serious outbreaks. The severe and widespread damage caused at present by this moth could be eliminated by controlling outbreaks that occur before the harvest.

Phillips (W. J.) & Poos (F. W.). **Two Hymenopterous Parasites of American Jointworms.**—*J. Agric. Res.*, xxxiv, no. 5, pp. 473–488, 5 figs., 5 refs. Washington, D.C., 1st March 1927.

When confined in cages *Eupelminus saltator*, Lind., deposited eggs freely on various species of *Harmolita* and their parasites, and also on *Mayetiola* (*Phytophaga*) *destructor*, Say. It has a wider range of hosts than any other parasite of *Harmolita* with the possible exception of *Eupelmus allyni*, French, and it is believed that it should become a valuable agent in the destruction of *Harmolita* spp. and *M. destructor*.

The various stages are described. The eggs are always laid on the outside of the host; as many as ten have been found in one cell, but as the larvae are cannibals, only one individual completes its development upon a single host larva. The eggs hatch in 1·5–4 days. The larva reaches maturity in 5–19 days, but does not pupate for another 2–28. The prepupal stage lasts 1–3 days, and the pupal stage 7–13. No males have been observed. The winter is passed as a full-grown larva in the cell of *Harmolita*. Six generations were reared in the laboratory from May to October; the duration of each cycle from egg to adult varied from 18 to 43 days, with an average of 23·5. Low temperatures in the spring and autumn retard development considerably.

Eridontomerus isosomatis, Riley, is widely distributed and probably occurs throughout all the wheat-growing regions of the United States. It will probably parasitise any species of *Harmolita*, though a certain preference is shown for the forms in the centre of the stems. It is usually a primary parasite, but becomes hyperparasitic and will parasitise its own species when the host is heavily parasitised. The eggs are laid in the cells, external to the host larva, either directly upon the host or in close proximity to it.

As many as five eggs have been found on one host, but observations indicate that only one parasite matures in a single cell. During July and August 1920 and 1921 the larvae reached maturity in 4–8 days. The pupal period of two individuals in glass cell slides lasted 9 and 11 days respectively. It is probable that this parasite has two generations a year throughout its range; in Virginia the adults of the first generation emerge in June and those of the second during the last week in July. The females are deuterotokous and greatly outnumber the males. The winter is passed as a full-grown larva in the cell of *Harmolita*.

Haseman (L.). **Summer Chinch Bug Control.**—*Ext. Serv. Circ. Missouri Coll. Agric.*, no. 176, 4 pp. Columbia, Mo., May 1926. [Recd. November 1927.]

The best methods for protecting crops in Missouri against the chinch bug [*Blissus leucopterus*, Say] during the summer and autumn are outlined. The bugs of the spring generation feed where they hatch, on the wheat, oat or rye crops, and at the wheat harvest crawl to maize or a similar crop. When adult, they disperse on the wing and oviposit round the base of maize plants, on which the second generation feeds before becoming adult and flying back to winter shelter in autumn. Apart from winter burning, the best time to kill the bugs is when the young ones crawl at wheat harvest time to maize, the barriers used for this purpose being described [*R.A.E.*, A, xiv, 166]. In the absence of other materials, a simple and fairly effective barrier can be made by placing a narrow ridge of salt, ground limestone or sand along a smooth path and keeping it moistened with coal oil ; this is, however, rather expensive. Should any bugs pass the barriers they should be killed by means of sprays, dusts or fire, or by ploughing deeply the first few rows of infested maize.

Where the pest is abundant, leguminous crops, such as soy-beans, should be planted in rows between wheat and maize.

CHITTENDEN (F. H.). U.S. Bur. Ent. **The Species of** *Phyllotreta* **north of Mexico.**—*Ent. amer.*, viii, no. 1, pp. 1–63, 2 pls., 2 figs., 3 refs. Brooklyn, N.Y., 1927.

This is a study of the the species of *Phyllotreta* occurring in America north of Mexico. The genus is classified into groups, and keys to and descriptions of the species, including several new ones, are given. The economic importance of these beetles is very briefly discussed ; some of the species are injurious to Cruciferous crops. *P. herbacea*, sp. n., has been observed in Colorado feeding on turnip.

FRY (H. J.). **Grasshopper Culture in the Laboratory.**—*J. N. Y. Ent. Soc.*, xxxv, no. 1, pp. 41–51, 1 fig., 3 refs. Lancaster, Pa., March 1927.

The life-cycle of certain grasshoppers may be greatly shortened by the regulation of temperature, so that several generations a year may be produced for laboratory and experimental work. The work of previous authors on this subject is reviewed, and the technique employed in the rearing of these insects is described.

ELTON (C.). **Animal Ecology.**—8vo, xxi+207 pp., 8 pls., 13 diagrams, 9 pp. refs. London, Sidgwick & Jackson, Ltd., 1927. Price, 10*s*. 6*d*.

In his preface the author states that while ecological studies can be applied to many different branches of animal biology, this book is chiefly concerned with what may be called the sociology and economics of animals, rather than with the structural and other adaptations possessed by them. One of the objects of the work is to show that the problems of animal ecology call for special methods of their own, distinct from those used in plant ecology.

The distribution of animal communities is studied along the various larger gradients in environmental conditions, these being divided in turn into smaller gradients of habitat. Examples of factors limiting the distribution of species are : hydrogen-ion concentration of water ; water supply and shelter ; temperature ; food-plants ; and interrelations with other animals. The last subject is so vast and complicated that it requires special treatment, and is discussed at length.

Succeeding chapters deal with time and animal communities, with the numbers of animals, with fluctuations in numbers, and with dispersal respectively.

In a chapter on methods the importance of correct identifications is strongly emphasised, and with it the necessity for collecting good systematic material, with ample data. The final chapter deals with ecology and evolution, and is followed by a diagram illustrating the relations of various branches of ecology to one another and to other sciences.

There is a comprehensive index and a bibliography, including a list of the more important works on British insects.

MARIÉ (P.). **Procédés mécaniques d'auto-défense corticale chez certaines conifères contre les attaques des Scolytides.**—*Rev. Path. vég. Ent. agric.*, xiii, fasc. 2, pp. 167–171, 1 fig. Paris, April–June 1926. [Recd. October 1927.]

In a mixed stand of *Abies pectinata* and *Picea excelsa*, in Savoy, the latter, though greatly in the minority, were heavily infested by the Scolytid, *Cryphalus piceae*, Ratz., even healthy trees being killed. *A. pectinata* was only very slightly affected, though galleries had been begun on all the healthy trunks. In the absence of sufficient unhealthy trees *C. piceae* will attack healthy ones, in which case the female makes only a shallow gallery, so that the larvae are not hampered by the sap in the tissues of the bast. These galleries have a local effect on the tree and prepare the way for the deeper galleries in the more usual situation between the bark and the wood. This method of attack is not possible in the case of *A. pectinata* as the bark is very thin and rich in resin, so that after penetrating the thin cork layer the beetles reach the living part of the bark. If such galleries are made slowly and the resin exudes at once, the beetle retreats and there is no other apparent reaction on the part of the tree, but when the galleries are made more rapidly and the resin does not exude until the beetle has penetrated some distance into the bark, it is trapped and eventually become covered with a mould. When the beetle is thus trapped, the tissues surrounding the gallery die. This dead portion, which is cone-shaped with the apex pointing inwards, eventually falls out, leaving a clean healed surface.

TROUVELOT (B.). **Précision de traitements permettant de combattre les punaises phytophages causant les fruits pierreux dans les vergers.**—*Rev. Path. vég. Ent. agric.*, xiv, fasc. 1, pp. 34–36, 2 refs. Paris, January–March 1927. [Recd. October 1927.]

This information concerning the control of the Capsid, *Calocoris fulvomaculatus*, DeG., on pears has already been noticed from another source [*R.A.E.*, A, xv, 116].

[VUKASOVIĆ] VOUKASSOVITCH (P.). **Observations biologiques sur les parasites de** *Plutella maculipennis*, **Curtis. (Lépidoptère, Plutellidae.)**—*Rev. Path. vég. Ent. agric.*, xiv, fasc. 2, pp. 113–118, 8 refs. Paris, April–June 1927.

This study of the parasites of *Plutella maculipennis*, Curt. (diamond back moth) was made at Belgrade in the spring of 1926 when the larvae were very numerous on turnips. Female moths bred and fertilised in the laboratory laid an average of 60 to 80 eggs, which required an incubation period of 4 days at an average temperature of 68° F. The larvae would feed on partly decayed as well as fresh leaves of crucifers, but when they were fresh, the young larvae mined the leaf tissues. By the 15th day all the larvae pupated, adults emerging 5 or 6 days later.

Four Ichneumonid parasites of the larvae were observed, none of which has apparently been previously recorded on this host. The most common was *Angitia cerophaga*, Grav., of which both fertilised and unfertilised females attacked *P. maculipennis* in the laboratory, frequently ovipositing in the young larvae within their mines, of which they attack several in turn. The older larvae, wandering on the leaves, are not attacked unless they are encountered accidentally. Parasitised larvae completed their development and constructed their cocoons, but a day or two afterwards the parasite larvae emerged and spun their cocoons within those of the hosts. The pupal stage lasted for 7 or 8 days at about 75° F. The male life-cycle occupied 18 days at about 71° F., an unfertilised female producing only 5 males. *Thyraeella collaris*, Grav., has been found in one instance parasitising a larva of *P. maculipennis*. *Diadromus subtilicornis*, Grav., was observed in nature as a parasite of the pupa, many more females than males being found. *Pimpla alternans*, Grav., was found in almost equal numbers in larvae and pupae ; in the former case, its cocoon was close to the remains of the larva, within the cocoon that it had constructed.

Of 80 larvae of *P. maculipennis* collected at the height of their occurrence (about mid-May) 38 were parasitised by either *Angitia* or *P. alternans* in almost equal numbers. The remaining 42 pupated, but from the pupae were reared 8 individuals of *P. alternans*, and 10 of *T. collaris* or *D. subtilicornis*. Only three adults of *P. maculipennis* emerged, 21 pupae having died. The effect of these parasites is therefore important, and, in the author's opinion, is at least in part responsible for the scarcity of the moths in the months following the outbreak.

SMEE (C.). **Report of the Entomologist.**—*Rep. Dept. Agric. Nyasaland 1926*, pp. 13–20. Zomba, 1927.

In view of the possible development of a native tobacco industry in Tanganyika Territory, the question of allowing transit of that product through Nyasaland was considered, the chief danger being a possible outbreak of *Lasioderma serricorne*, F. (tobacco beetle) in the event of large quantities of cured tobacco being held up in Nyasaland owing to lack of transport facilities. Regulations for preventing such a contingency so far as possible were suggested. A similar question regarding coffee from the Tukuyu area of Tanganyika hinged entirely upon the possible presence there of *Stephanoderes hampei*, Ferr., and it was decided to maintain rigorous inspection of all consignments from that area until such time as the pest might be proved to be absent.

On tobacco, there was a serious outbreak of *Oecanthus pellucens*, Scop., the hearts and young leaves of small plants being devoured. Heavy downpours of rain probably caused excessive hatching at one time, so that large numbers of the adults, which are normally carnivorous rather than phytophagous, were present when tobacco offered a most favourable food-supply. Rain frequently rendered dust applications of Paris green and flour, or lead arsenate, which were otherwise successful, practically valueless. A new tobacco pest, which has as yet only appeared sporadically, is the larva of the weevil, *Dereodus recticollis*, Mshl., which bores into the stems just above and below soil level, causing them to rot, and the plants to break off, when the grubs continue to live in the soil, feeding on the roots. They are most prevalent in late plantings, and particularly in small plants in February, the adults emerging in March. Alternative food-plants are cotton, groundnuts and sunflowers, and the two most serious infestations observed were on tobacco following groundnuts and cotton. A proprietary naphthalene compound destroyed the grubs when applied in small quantities and stirred up with soil near the attacked plants. Turkeys readily devour the grubs. Surface beetles, such as *Emyon* sp., *Zophosis agaboides*, Gerst., *Macropoda reticularis*, Gerst., and *Psammodes* sp., appear in numbers when the fields are not kept well cleaned prior to planting. Plants with their leaves flattened by rain attract the beetles, which shelter under the leaves and then attack the stems. Hand-picking, if insufficient, can be supplemented by a poison bait of Paris green distributed near the plants and in heaps of weeds left in the fields, where the beetles will concentrate.

On cotton, the presence of *Platyedra gossypiella*, Saund. (pink bollworm) in north Nyasaland has been confirmed. *Sylepta derogata*, F. (cotton leaf-roller) and *Syagrus morio*, Har. (black leaf-beetle) were injurious in one district.

In Nyasaland there are no tea pests that devastate the crop, as is the case in some parts of the world, but there are many indigenous insects that may attain very serious importance. The chief of these is *Helopeltis bergrothi*, Reut. (tea mosquito-bug), which is indigenous in central and west Africa and feeds on a variety of crops, including cotton and native gourds. The annual pruning of tea serves to check the continued increase of the Capsid from one season to another, but the damage done by it is accomplished before pruning takes place. and unpruned plants in nurseries still provide food when the older bushes are lacking in foliage. The Capsids appear in maximum numbers in February or March, while the tea flush attains its greatest yield during the previous two months, the actual periods varying from season to season. Normally, therefore, the main flush will escape the maximum attack, but the latitude is not great and any circumstances that caused the two to coincide would result in enormous damage. *H. bergrothi* begins to increase rapidly in December soon after the onset of the rains ; from May to November there is a steady fall in numbers. There is always a period in the year (in the season under review it extended from 21st October to 8th December) when the Capsids are practically absent, and this period seems to be correlated to some extent with the rainfall. Hand-collection should therefore be practised as soon as the rains begin, especially in nurseries and new plantations. *Tetranychus bioculatus*, W.M. (red spider) appears locally every season, the affected areas being usually those where soil conditions need improving. One area in which *T. bioculatus* caused considerable damage has been rendered comparatively free from attack in four years by planting trees and improved drainage. As soon as new foliage appears after pruning, applications of lime-sulphur should be made as a spray or dust in gardens likely to become infested. A recently discovered weevil, *Dicasticus* [*mlanjensis*, Mshl.], is a potential pest of young tea, the adults eating the leaves. The eggs are laid in April, under the folded tip of a leaf or between two leaves that are glued together ; in captivity one female laid 480 in 10 batches during 3 weeks. Hatching takes places in 7–10 days, and the larvae fall to the ground and burrow in the soil. If they should attack the roots of young tea plants the result would probably be serious. Minor pests of tea bushes were the Coreids, *Riptortus longipes*, Dall., *R. dentipes*, F., and *Anoplocnemis* *curvipes*, F., which suck the young shoots, producing withered tips. Grasshoppers, particularly *Catantops melanostictus*, Schaum, and *Acanthacris* sp., feed on the older leaves, but do little damage, the former being preyed upon by several Asilid flies.

On coffee, one of the most serious pests is *Antestia*, but its abundance varies greatly from year to year, as in most seasons the eggs are heavily parasitised. If control measures are necessary, a spray of ¾ oz. sodium arsenite and 2½ lb. sugar or jaggery in 4 gals. water should be applied as a fine mist, allowed to fall lightly on the outside of the bushes, the spray nozzle being directed upwards while the operator walks at a steady pace between the rows. *Anthores leuconotus*, Pasc. (white stem-borer) injures coffee more than any other insect. The adults appear with the rains and devour the young shoots, and the eggs are laid on the bark soon after; hand-collection of the adults as soon as they appear is essential. The larvae work for at least two years in the stem and roots [*R.A.E.*, A, x, 23]. Plants about 2 or 3 years old are most frequently infested and may look perfectly healthy for two years more, but gradually begin to wither in the dry weather. A good method of dealing with the larvae is to remove the plug of frass extruded from the cavity where each is situated and insert a few crystals of paradichlorobenzene, subsequently covering the hole with mud or clay. Grubs so treated were dying within six days and had completely disintegrated in three weeks, while the bushes seemed to be uninjured. This method is simpler than the use of carbon bisulphide. Various poisons have been tested as deterrents to oviposition or to kill the newly hatched larvae. Any deterrent paint would have to withstand torrential rainfall, but a proprietary form of tanglefoot grease shows promise. Lead arsenate, sodium fluoride and zinc sulphate were all used, both with and without a resin and washing soda adhesive and also in conjunction with paradichlorobenzene, which, however, when melted for incorporation in the poison, evaporated too quickly to be of any value. Zinc sulphate appeared the least resistant to weather conditions; after two months, during which torrential rains fell, the lead arsenate and sodium fluoride pastes were still present to some extent, particularly where adhesive had been used. Two-year-old plants showed no ill effects from this treatment. *Apate* sp. (black stem-borer), which is usually found boring in poles, baskets, etc., appears sporadically on coffee, usually just before the rains, the adult boring right into the stem, generally in the centre of the bush but sometimes near the ground, which becomes covered with frass from the burrows. Paradichlorobenzene crystals inserted into the burrows, which were then plugged with clay, killed the beetles in from 12 to 24 hours, and the crystals had not disintegrated after three days. The larva of a beetle, probably *Dirphya* sp., has been reported as boring in the smaller shoots of coffee; it can be checked by pruning off the infested shoots or by using paradichlorobenzene. An undetermined thrips appears every dry season and becomes more numerous as dry weather continues; when the rains break it disappears and the condition known as "die-back" sets in on the affected bushes, no crop being produced. Bushes grown without shade seem to suffer particularly. Ordinary sprays, such as tobacco extract and paraffin emulsion, were successful when used early; when the pest was firmly established an extract of the leaves of the local fish-poison plant, *Tephrosia vogeli*, proved an efficient spray. The crushed leaves were soaked in a little water, squeezed and strained through sacking, 1 lb.

being used to 12 gals. water, with 4 oz. soap added as a spreader. The cost of 24 gallons of this spray was about 10*d.*, as against 7*s.* for the same quantity of paraffin emulsion. Minor coffee pests are the grasshoppers, ?*Aularches* sp. and *Enyaliopsis petersi*, Schaum, which should be collected regularly by hand ; the eggs of the former are laid in batches in the soil and cultivation tends to destroy them. The cutworm, *Euxoa segetum*, Schiff., appears with the rains ; shields made from banana stems placed round the stems at ground-level have been used with success, and metal shields will be tried. A few leaf-eating caterpillars, such as *Parasa vivida*, Wlk., attack coffee and should be collected by hand. This species also feeds on cotton and castor, and the latter plant should be carefully watched if used as a temporary shade for young coffee. A leaf-mining caterpillar, probably *Leucoptera* sp., causes the appearance of brown blotches on the leaves.

Busseola fusca, Fuller (maize stalk borer) causes considerable damage to maize. The moths have been reared from stalks of maize and millet from growing crops and from old stalks left lying on the ground from January to June ; healthy larvae have been taken from old stalks left in the ground in September. A few parasites have been reared, but the rate of parasitism is low. The removal and destruction of old stalks and thorough cultivation of the fields immediately after the crop is harvested are essential.

The larva of a Pyralid, *Terastia* sp., damaged young dadap (*Erythrina*) in nurseries so severely that almost every tree died. A serious outbreak of *Ceroplastes* sp. occurred on *Cedrela toona*. Larvae of the weevil, *Alcides erythropterus*, Chev., made large galls in the stems of velvet beans [*Stizolobium*], the adults emerging in October and November. A successful temporary measure against termites in house walls and floors was an application of carbon bisulphide followed by paradichlorobenzene, forced into the runways and between the bricks ; this was effective for three months.

SMEE (C.). **First Reports on Pests and Diseases of Tea and Coffee in Nyasaland.**—*Bull. Dept. Agric. Nyasaland*, Ent. Ser., nos. 1 & 2, 6 & 4 pp. Zomba, December 1927.

These two bulletins on tea and coffee pests respectively are reprinted from the report noticed above.

BROOKS (A. J.). **Work connected with Insect and Fungus Pests and their Control. Observations on Groundnuts.**—*Ann. Rep. Dept. Agric. Gambia 1926–27*, pp. 35–41. London, 1927.

Groundnuts are severely damaged by rosette disease, which in South Africa is said to be transmitted by *Aphis leguminosae*, Theo. This Aphid is not known to occur in Gambia, but a Capsid and a Jassid are present on the groundnuts, and it is thought that the latter may be the transmitting agent. Much injury to this crop is also done by termites. An examination of four varieties of groundnut showed a loss of 10 per cent. of the crop, or at least 6,000 tons in Gambia in a season. Termites prefer healthy plants to those affected with rosette disease, but when the latter are attacked the damage done is the same. Large and small plants are attacked indiscriminately. A native practice is to place a piece of dead wood in the ground where the termites are observed at work, which acts as a bait until the crop is lifted. Experiments with cyanogas calcium cyanide are to be tried.

FISHER (R. C.). **Parasites of the Pear-midge** (*Perrisia pyri*). **Collection of Material in France.**—*N.Z. J. Agric.*, xxxv, no. 2, pp. 107–111, 1 fig. Wellington, 20th August 1927.

MILLER (D.). **Parasites of the Pear-midge** (*Perrisia pyri*). **Report on the 1926 Consignments from Europe.**—*T.c.*, no. 3, pp. 170–175, 1 fig. 20th September 1927.

Since the first attempt to introduce *Misocyclops marchali*, Kieff. (*Platygaster* sp.) as a parasite of the pear-midge, *Dasyneura* (*Perrisia*) *pyri*, Bch., into New Zealand [*R.A.E.*, A, xiv, 523], further consignments have been sent from both England and France. The manner of packing and preserving these is explained. On arrival in New Zealand the material was placed in cold storage, from which it was periodically removed as required. The first two consignments arrived in August and early September. Pear leaves in the open began to expand in the first week of September, and by the 17th the first midge was observed. As soon as the leaves showed signs of growth, a batch of parasites was liberated. The greatest number of *Platygaster* was obtained from the material from France, July and August being the best months for collecting parasitised material. Moisture was essential to the parasites, and the best containers were tins with sealed paper lids or wooden boxes wrapped in waxed paper. The records of emergences are shown in tables ; 66 per cent. of the parasites obtained were females.

IKEDA (N.). **On a Trypetid infesting** *Senecio kaempferi*. [*In Japanese.*] *Insect Wld.*, xxxi, no. 11, pp. 368–369. Gifu, November 1927.

A Trypetid is known to be the cause of galls on the stalks of *Senecio kaempferi*, which is used as a vegetable in Nagasaki. It has one generation a year, and hibernates in the adult stage. From 5 to 7 flies emerge from each gall at the end of October or the beginning of November.

ROXAS (H. A.). *Pericyma cruegeri* (**Butler**) **: Its Life History and Economic Importance** (**Noctuidae, Lepidoptera**).—*Philipp. Agric.*, xvi, no. 4, pp. 229–233, 2 pls., 4 refs. Los Baños, September 1927.

The Noctuid, *Pericyma cruegeri*, Butl., is known from Australia, Borneo and the Philippines ; the only food-plant of the larvae known to the author is *Peltophorum inerme*, which is indigenous from Ceylon to Australia, and is a common shade tree in the Philippines. When the larvae are very numerous the trees are defoliated, but so long as food is abundant only the edges of the fresh leaves are eaten. The trees recover from the attack in a short time.

In 1920 and 1921 two broods were observed, the larvae of the first appearing about the middle of February and those of the second about the middle of March. From the middle of April until February the insect is not seen, but the stage in which it passes this period is not known. Pupation usually occurs on the food-plant.

In 1921, about 70 per cent. of the second brood pupae were parasitised by *Brachymeria* (*Chalcis*) *albotibialis*, Ashm., which is very abundant towards the end of March and oviposits in the host at the prepupal stage ; very few first brood pupae were parasitised. In an editorial foot-note L. B. Uichanco states that *B. albotibialis* has frequently been bred from pupae of the Hesperiid, *Erionota thrax*, L. (banana leaf-roller) in the Philippines.

[GUPTA (S. R.).] **Entomology.**—*Rep. Dept. Agric. Assam 1926–27*, pp. 31–32. Shillong, 1927.

Rice pests in Assam in 1926–27 included *Leptocorisa varicornis*, L., which was the most important, *Thrips oryzae*, Williams, *Ripersia* [*sacchari*, Green], *Schoenobius incertellus*, Wlk. (*bipunctifer*, Wlk.) (rice stem-borer), which was controlled to some extent by the use of light traps, the collection of egg-masses and the burning of the stubble, *Nymphula depunctalis*, Gn. (rice case-worm), *Hispa armigera*, Oliv., *Spodoptera mauritia*, Boisd., and *Prodenia litura*, F. Jute was attacked by *Anomis* (*Cosmophila*) *sabulifera*, Gn. (jute semi-looper), for which dragging a rope soaked in kerosene over the infested crop proved a useful control measure, and *Diacrisia obliqua*, L., which also attacked pulse crops. Mustard was attacked by *Athalia proxima*, Klg. (mustard sawfly), which was controlled by dusting with ash and lime. *Odoiporus longicollis*, Oliv., injured bananas in one locality.

MCCOLLOCH (J. W.), HAYES (W. P.) & BRYSON (H. R.). **Preliminary Notes on the Depth of Hibernation of Wireworms (Elateridae, Coleoptera).**—*J. Econ. Ent.*, xx, no. 4, pp. 561–564. Geneva, N.Y., August 1927.

Observations on the hibernation of Elaterid beetles, carried on in Kansas in 1922–23, when the average depth of the larvae found was 7·7 ins., and in 1925–26, when the average depth was 10·1 ins., showed that the larvae are frequently found above a depth of 6 ins., even in mid-winter, where they encounter much colder conditions than those deeper in the soil, some of which go down as far as 36 ins. This would indicate that the practice of autumn ploughing to expose wireworms to the cold, so frequently recommended, may have less value than has been supposed.

These observations can only be applied to wireworms in general, as many of those observed could not be reared to the adult stage owing to their long larval period, but the majority of the adult specimens collected in the area where these studies were made belong to the genera *Melanotus*, *Monocrepidius*, *Lacon*, *Agriotes* and *Ludius*.

CROWELL (M. F.). **The Effect of Submergence during the Hibernating Period on Pupal Formation and Adult Emergence in the European Corn Borer.**—*J. Econ. Ent.*, xx, no. 4, pp. 564–567, 3 refs. Geneva, N.Y., August 1927.

A single small experiment was carried out from 25th March till 20th July 1926 with hibernating larvae of *Pyrausta nubilalis*, Hb. (European corn borer) removed from maize stalks to determine the effect of submergence in water on the larvae during the dormant period [*R.A.E.*, A, xv, 537] and on the subsequent life-history of surviving individuals. Of larvae immersed during the latter part of the hibernating period for 11 days, 78 per cent. died before pupation, as compared with 38 per cent. of those left untreated. The pupation of the surviving larvae and the time of emergence of the adults is apparently little affected, the average pupal period of individuals submitted to submergence being 19·57 days and that of larvae not so treated 18·5 days. The appearance of the first adult and the date of maximum emergence were the same for treated and untreated pupae, moths emerging from 80 per cent. of the pupae of immersed larvae and from 91·66 per cent. of the pupae of the controls.

Yothers (M. A.). U.S. Bur. Ent. **Summary of three Years' Tests of Trap Baits for capturing the Codling Moth.**—*J. Econ. Ent.*, xx, no. 4, pp. 567–575. Geneva, N.Y., August 1927.

The following is chiefly taken from the author's summary of this paper, part of the information contained in which has already been noticed [*R.A.E.*, A, xv, 592]. Tests carried out in Washington in 1923, 1925 and 1926 showed that in badly infested apple orchards large numbers of codling moths [*Cydia pomonella*, L.] can be captured by means of properly baited traps. Of the various baits used in the tests, cooked apple juice fermented with yeast and containing apple pulp proved more attractive to the moths than vinegar, cider or various essential oils, though in 1926 a ferment of molasses and yeast proved much more effective than apple ferment or honey ferment, which is too expensive for general use. Molasses ferment costs approximately 2*s.* 6*d.*, and apple ferment about 2*s.* a tree for one season.

About 55 or 60 per cent. of the moths captured are females, of which 95 per cent. have laid few or none of their eggs. The moths are not attracted to the baits during cool weather, the majority being captured while the mean temperature is 70° F. or higher. In a baited test block of 42 trees, final counts of unattacked fruit at harvest time showed an increase of from 12 to 16 per cent. over similar varieties treated with the same spray but unbaited.

Little (V. A.). **Calcium Cyanide for the Control of the Squash Bug,** *Anasa tristis*, **De Geer.**—*J. Econ. Ent.*, xx, no. 4, pp. 575–577. Geneva, N.Y., August 1927.

In experiments carried out in Texas during the summer of 1926 for the control of *Anasa tristis*, DeG., on squashes, over 80 per cent. control of both nymphs and adults was obtained with undiluted cyanogas calcium cyanide " A " dust [*R.A.E.*, A, xiv, 74], efforts to control the bugs with 2 per cent. and 4 per cent. nicotine dust having proved inefficient. A mixture of two parts " A " dust with one part air-slaked lime was rather less successful. The dust was applied with a hand duster in the open air; about 1½ oz. being used for each hill. Though all the bugs were stupefied, a proportion recovered, the highest mortality occurring with young nymphs. As the nymphs are only found in numbers on the leaves when they are small enough to be brushed to the ground before dusting, direct application of the dust to the leaves, which sometimes causes scorching, is unnecessary.

LATHROP (F. H.). **Leaf-hoppers injurious to Apple Trees in the Hudson Valley.**—*J. Econ. Ent.*, xx, no. 4, pp. 577–581, 2 figs., 1 ref. Geneva, N.Y., August 1927.

Severe leafhopper infestation of apple orchards in the Hudson Valley at first thought to be solely due to *Typhlocyba rosae*, L., was found to be partly due to *T. pomaria*, McAtee. This leafhopper spends its entire life-cycle on apple, whereas *T. rosae* passes the winter on rose. The characters distinguishing the two species are given. The injury they do takes the form of white stippling of the foliage, resulting in serious loss of chlorophyl in severe cases, while the honey-dew that they discharge discolours the fruit.

The winter eggs of *T. pomaria*, which are found in apple bark, began to hatch on 19th May, two weeks later than those of *T. rosae*. The first adults appeared during the third week in June and the first eggs of the second generation were observed on 23rd July, as many as 14 eggs being found 3 days later in the petiole, midrib and larger veins of a single leaf. Hatching began during the second week in August, and adults first appeared in mid-September, the over-wintering eggs being laid during November. The injury reached its height in the latter half of August, when the adults of the first generation and all stages of nymphs of the second were present on the foliage.

The most effective control of *T. pomaria* was secured by an application of nicotine sulphate ($\frac{3}{4}$ pt. to 100 gals.), applied in May or early June after all the overwintering eggs had hatched, but before any adults appeared. A 2 per cent. nicotine-lime dust proved satisfactory during mid-July when the adults predominated. Oil sprays, applied at the delayed dormant period, proved ineffective in destroying the eggs.

DAVIS (E. W.). U.S. Bur. Ent. **Notes on Collections of the Sugar Beet Leaf-hopper showing the Extension of its known Range into British Columbia and to the Coast in Washington and Oregon.**—*J. Econ. Ent.*, xx, no. 4, pp. 581–586, 1 map. Geneva, N.Y., August 1927.

Throughout this survey, in the course of which the range of *Eutettix tenella*, Baker (sugar-beet leafhopper) was found to extend into British Columbia 140 miles north of the international boundary, curly-top disease was present wherever the leafhopper was found on beets or mangels. Observations on other food-plants are also recorded.

SEVERIN (H. H. P.) & SEVERIN (H. C.). **Curly-top of Sugar Beets in South Dakota.**—*J. Econ. Ent.*, xx, no. 4, pp. 586–588. Geneva, N.Y., August 1927.

Surveys made in August and September 1926 over wide areas in South Dakota, in the west-central portion of which curly-top of sugar-beet was found to occur on rare occasions, failed to reveal the presence of *Eutettix tenella*, Baker (sugar-beet leafhopper) in sweepings with a net from its most favoured food-plants. Curly-top was experimentally transmitted to healthy beet seedlings from beets from South Dakota showing symptoms of the disease. The conditions prevailing in west-central South Dakota are such that *E. tenella* could breed there.

Investigations should be conducted to determine whether west-central and north-western South Dakota is the boundary of a natural breeding area of *E. tenella*, or whether a migration into South Dakota takes place from regions outside the State.

Aldrich (J. M.). **The Dipterous Parasites of the Migratory Locust of Tropical America,** *Schistocerca paranensis*, **Burmeister.**—*J. Econ. Ent.*, xx, no. 4, pp. 588–593. Geneva, N.Y., August 1927.

These notes on the parasites of *Schistocerca paranensis*, Burm., which is a serious pest from Argentina to Southern Mexico, are mainly based on material obtained by Dr. Dampf in Mexico and by the author in Guatemala.

One of the most important known parasites of *S. paranensis* is *Sarcophaga caridei*, Brèthes, which has been recorded from the United States, Mexico, Guatemala and Argentina. A record is given of all the known hosts of *S. sternodontis*, Towns. (*sarraceniae*, Riley), which is probably a true parasite at times, while at others it merely deposits its larvae on the dead insects. The range of this abundant tropical fly extends as far north as the Gulf of Mexico and at least as far south as Brazil. Its value as a parasite of locusts is unknown. The synonymy of these two species is discussed, together with that of *Brachycoma acridiorum*, Weyenbergh, an important parasite of the locust in Argentina, but which is not yet known in tropical North America. *Oedematocera dampfi*, Ald., a species widely distributed in Mexico and Central America, deposits its larvae in the abdominal cavity of the locust. It is not known how long a parasitised locust can live, or whether a parasitised female can lay eggs, though it appears improbable that eggs can develop when one or more larvae are present.

Van Leeuwen (E. R.) & van der Meulen (P. A.). **Further Information on a Contact Spray for the Control of the Japanese Beetle** (*Popillia japonica*, **Newm.**).—*J. Econ. Ent.*, xx, no. 4, pp. 603–607, 1 ref. Geneva, N.Y., August 1927.

In view of the satisfactory results obtained against *Popillia japonica*, Newm., with a contact spray consisting of oleoresin of pyrethrum flowers and sodium oleate [*R.A.E.*, A, xiv, 656], various materials were added to this combination in an endeavour to lessen its cost and to improve its effectiveness. Since the original formula, when applied to beetles in cages, gave nearly 100 per cent. control, it was necessary, for purposes of comparison, to use a less concentrated solution. A mixture of 86½ oz. sodium oleate, 9½ oz. oleoresin of pyrethrum flowers and 100 U.S. gals. water, killed 49 per cent. of the beetles in 24 hours and 67 per cent. in 48 hours. The addition of 6 fl. oz. sodium silicate solution (9·01 per cent. Na_2O, 28·35 per cent. SiO_2, 62·64 per cent. H_2O) to this mixture resulted in a mortality of 71 per cent. in 24 hours and 85 per cent. in 48 hours, increasing the toxicity of the mixture by 22 per cent. and 18 per cent. respectively. Other materials tested, which included kerosene, cresylic acid, glycerine, carbon tetrachloride and gum arabic, proved practically valueless.

MacLeod (G. F.), Haley (D. E.) & Sudds (R. H.). **A Study of Arsenical Residues on Apples in Pennsylvania with Respect to efficient Spraying Practices.**—*J. Econ. Ent.*, xx, no. 4, pp. 607–614, 1 graph, 2 refs. Geneva, N.Y., August 1927.

Studies were carried out in 1926 in Pennsylvania to ascertain quantitatively the amount of residual arsenic present on apples that had received the minimum quantity of spray material required for the adequate protection of the fruit. Late spraying was necessary on account of the presence of the codling moth [*Cydia pomonella*, L.], *Eulia velutinana*, Wlk. (red-banded leaf-roller), *Tortrix* (*Archips*) *rosaceana*, Harr. (oblique-banded leaf-roller) and *Amorbia humerosana*, Clem. The spraying schedule employed in 1926 is given. It was found that the omission of one or more of the six applications of lead arsenate resulted in injury to the fruit. Where oil sprays were employed, no lead arsenate was used in the delayed dormant period, but in either instance the fruit received four lead arsenate sprays from the time of the petal fall treatment to the end of the spraying season. The results of commercial spraying in 18 orchards in various parts of south-eastern Pennsylvania show that the number of applications prescribed was in general sufficient to protect the fruit, while any diminution in the numbers of treatments would not have afforded adequate protection. Tables are given showing the results of arsenical analyses of spray residues on samples from each of these orchards, the methods of sampling and analysis being described. The results of these analyses, which were all made previous to handling, showed that while arsenic was found on all samples with one exception, in no case was the quantity equal to 0·01 grain to a pound of apples, the stated British tolerance, and when the fruit was presented for public consumption, the amount was reduced to a trace. Rains in excess of normal tended to reduce the amount of spray deposit. As much arsenic was found on apples having no visible spray residue as on those having considerable residual material on their surface. Different samples obtained from the same orchard and receiving the same treatment showed a uniform quantity of arsenic present.

Worthley (H. N.). **Reducing the Cost of Nicotine Sulphate Sprays.**—*J. Econ. Ent.*, xx, no. 4, pp. 615–625, 7 refs. Geneva, N.Y., August 1927.

Studies were carried out to discover the merits of a number of chemicals as liberators of nicotine from spray solutions of 40 per cent. nicotine sulphate. Among those tried, sal soda appeared to throw off the nicotine most rapidly, while under conditions where it is desirable to liberate the nicotine slowly over a longer period of time, potash fish-oil soap proved most suitable, mixing readily with water and giving a beneficial physical character to the spray solution. The amount of sal soda or potash fish-oil soap required to neutralise 1 cc. nicotine sulphate is 0·34 gm. or 1·1 cc. respectively. The evolution of nicotine from 1–100 nicotine sulphate with twice this amount of sal soda is 61 per cent. in 4 hours, and 100 per cent. in 24 hours; with twice the amount of potash fish-oil soap the percentages are 34, 69 and 77 in 4, 24 and 48 hours as compared with 15, 30 and 35 in the absence of any liberator. Sal soda is a more efficient liberator than sodium hydroxide and gives a lower alkalinity to the spray solution, the greatest alkalinity not being attended by the greatest evolution of nicotine. Bordeaux mixture and lime-sulphur are good liberators of nicotine, 96·75 per cent. of nicotine being evolved in 24 hours from a 1–100 nicotine sulphate in 4–4–50 Bordeaux mixture, and 70·84 per cent. in 1–40 lime-sulphur, as compared with 100 per cent. by the addition of sal soda at twice the strength necessary to neutralise the nicotine sulphate and 28·78 per cent. with no liberator. Tests carried out against insects showed that the use of liberators may allow a reduction of the amount of nicotine required to kill in certain cases. This is accomplished by the increased concentration of the nicotine in the atmosphere surrounding the insects by more rapid evolution of the nicotine fumes.

Against *Myzus persicae*, Sulz., a dilution of 1–2500 nicotine sulphate with potash fish-oil soap gave 95 per cent. control, while 1–1200 with no liberator gave only 94 per cent. control. Against *Aphis pomi*, DeG., nicotine sulphate alone at 1–1200 was little better than at 1–2000 with lime-sulphur, while the addition of sal soda to the regular orchard combination spray appears to make nicotine sulphate perfectly effective against this Aphid at 1–2000. At the rate used in these tests, a 100 U.S. gal. tank of 40 per cent. nicotine sulphate, 1–1000, requires 8 oz. sal soda or 1½ U.S. pts. potash fish-oil soap. The average percentage of control secured against *Melittia satyriniformis*, Hb., with nicotine sulphate, 1–250, alone was 73 per cent. and with a 1–500 solution and fish-oil soap, 80 per cent., no control being obtained with a 1–500 solution with the addition of sal soda. The failure of the latter was probably due to the extremely swift evolution of nicotine, which dissipated the poison before it could penetrate into the eggs, while fish-oil soap not only increased the evolution of nicotine, but favourably affected the physical nature of the film spray, which spread, stuck and dried over the eggs, thus aiding the penetration of the poison.

GINSBURG (J. M.). **Chemical Studies of the Sulfur-lime Dry Mix Spray in Regard to the Formation of Water Soluble Arsenic.**—*J. Econ Ent.*, xx, no. 4, pp. 625–631, 19 refs. Geneva, N.Y., August 1927.

Acid lead arsenate ($PbHAsO_4$) is now more extensively employed in orchard sprays than any other arsenical. As, however, lead is a weak base, and any of the stronger bases, such as potassium, sodium or even calcium, when present in soluble form, will readily replace it and combine with the arsenate radical to form soluble salts, acid lead arsenate cannot be safely used in spray mixtures containing soluble soaps or oils emulsified by the aid of soaps [*R.A.E.*, A, xi, 393]. A concentration of lead arsenate sufficient to kill insects also injures the foliage unless some corrective is added, hydrated lime having been included in the sulphur-lime dry-mix spray hitherto in use [*R.A.E.*, A, xv, 83] for this purpose. This mixture offers an ideal spray since it serves as a combined insecticide and fungicide and is easily handled, though appreciable scorching that has been definitely traced to lead arsenate occurs on peach and apple trees.

The following is largely taken from the author's summary : Chemical investigations in which the water-soluble arsenic (As_2O_5) was determined from 23 mixtures of sulphur-lime dry-mix spray, each containing an equal quantity of acid lead arsenate, but varying in its composition and concentration of the other three ingredients (hydrated lime, sulphur and casein-lime) indicate that sulphur alone in the absence of both casein-lime and hydrated lime does not appreciably influence the decomposition of acid lead arsenate. When casein-lime is added to acid lead arsenate in the absence of hydrated lime, large quantities of water soluble arsenic are formed. As this does not occur when either casein or skim milk is substituted for casein-lime, it is apparently due to the partial carbonation of the lime that occurs in the latter material upon standing. Calcium carbonate in solution reacts directly with the lead arsenate, forming soluble arsenic salts. The presence of an excess of hydrated lime greatly retards the formation of soluble arsenic, but does not entirely eliminate it, the smallest quantity being found when 6 or 8 lb. hydrated lime were used in 50 U.S. gals. spray. A decided reduction in soluble arsenic was found when powdered skimmed milk was substituted for casein-lime, while no decrease in spreading was observed.

NELSON (F. C.). **The Penetration of Contact Oil Spray into the Breathing System of an Insect.**—*J. Econ. Ent.*, xx, no. 4, pp. 632–635, 3 refs. Geneva, N.Y., August 1927.

Contrary to the conclusions drawn from previous experiments with contact insecticides [*R.A.E.*, A, v, 23, etc.], which seem to prove that volatile gas is all that penetrates the breathing system of insects subjected to sprays such as nicotine sulphate and pyrethrum extract, work carried out with " flit," a commercial insecticide, and kerosene, leads to the belief that a greater penetration of the liquid into the tracheal tubes takes place than has hitherto been supposed.

Bees and flies, when sprayed with " flit," were killed in a few minutes, though when placed in a bell jar filled with the spray in the form of gas the bees did not die in less than 4 to 5 hours, or the flies in less than 2 to 3 hours. Bees died at least 2 hours sooner in sealed jars containing " flit " in vapour form than in those containing it in gas form. Dissections of the larvae of meal-worms (*Tenebrio molitor*, L.) sprayed with " flit " coloured red showed spray present in the very minute branches of the tracheae a few minutes after spraying. Tests on bees with direct sprays of coloured " flit," in which dissections were made both immediately and at an interval of 12 hours after spraying, showed the movement of the liquid spray up into the smaller tubes and revealed its presence in a large number of the minute branches of the tracheae surrounding the digestive tract and the nervous system. Twelve bees dipped in liquid " flit " for 30 seconds all died, and when dissected showed coloured liquid throughout the breathing system. Tests of varying duration, in which bees were subjected to spray floating in the air instead of being sprayed directly, showed increasing penetration of the liquid in proportion to the length of treatment, the ganglia, muscle tissue and some of the Malpighian tubes showing colour after 15 hours.

In a similar series of tests made with coloured kerosene no difference in results was observed, except in the rate and percentage of mortality. About 60 per cent. of the bees were killed with the same volume of spray that killed 100 per cent. with " flit," showing that the toxic action of the latter was not merely due to the blocking of the spiracles or tracheae, but that the active agent in it was brought in closer contact and greater concentration in the breathing system, thus causing a rapid kill. A final test showed conclusively that the dye was carried by the liquids, and did not leave them to penetrate the chitinous layer of the tracheae and pass from cell to cell in the epithelium.

The penetration of a spray such as that described undoubtedly depends on its surface tension.

Cotton (R. T.) U.S. Bur. Ent., & Roark (R. C.). **Ethylene Dichloride-Carbon Tetrachloride Mixture ; a new non-burnable, non-explosive Fumigant.**—*J. Econ. Ent.*, xx, no. 4, pp. 636–639, 1 ref. Geneva, N.Y., August 1927.

A brief account is given of the physical and chemical properties of ethylene bichloride, which appears to be well adapted for general fumigation in air-tight vaults. It does not burn readily and is absolutely uninflammable when mixed with carbon tetrachloride in the proportions of 3 parts to 1 by volume. Tests of this mixture were carried out against *Tineola biselliella*, Humm. (clothes moth), *Anthrenus vorax*, Csy. (furniture beetle) and *Attagenus piceus*, Ol. (black carpet beetle), the insects being placed in cotton-stoppered vials and rolled up in rugs or buried in the stuffing of upholstered furniture. The fumigant was poured into a shallow pan near the ceiling of the vault. At 85° F. all the insects were killed by a concentration of 6 lb. to 1,000 cu. ft., the exposure lasting 24 hours. At 65° F. the same or a somewhat higher dosage killed only 50–95 per cent. of the insects, but a dosage of 12 lb. to 1,000 cu. ft. killed 100 per cent. Ethylene bichloride alone at the rate of 6 lb. to 1,000 cu. ft. killed 100 per cent. of the insects at 80° F., while 30 lb. carbon tetrachloride at 85° F. was necessary to kill 100 per cent. A dosage of 14 lb. to 1,000 cu. ft. at 80° F., which is the strength recommended for general fumigation, gave a perfect kill in a special test against *Tribolium confusum*, F. (flour beetle) and *Calandra* (*Sitophilus*) *oryzae*, L. (rice weevil) sealed up in cartons of cereals, *Plodia interpunctella*, Hb. (Indian meal moth) and *Silvanus* (*Oryzaephilus*) *surinamensis*, L., buried in boxes of sweets, and other insects buried in piles of clothing and rugs. The fumigant is cheap, is not injurious to furniture or fabrics, is simple to use, and is not dangerous unless inhaled in high concentrations for a long period.

Roark (R. C.). **Importance of Patent Literature to Economic Entomologists.**—*J. Econ. Ent.*, xx, no. 4, pp. 640–641. Geneva, N.Y., August 1927.

Patent literature often describes for the first time valuable new insecticides, gives the composition of proprietary preparations sold under extravagant insecticidal claims, and supplies details of new apparatus and processes for the application of insecticides and for the destruction of insects by physical means. Paradichlorobenzene, sodium fluoride and chloropicrin were first described as insecticides through this medium. Patent literature, however, is never mentioned in any of the medical or biological abstract journals, while the chemical abstract journals contain abstracts only of such patents as relate to the manufacture or use of various chemicals or insecticides. In order to supply this deficiency, the Insecticide and Fungicide Laboratory of the U.S. Bureau of Chemistry, Washington, D.C., has started a quarterly review, which gives abstracts of the United States patents relating to insecticides and fungicides. It is planned to extend this review, which is sent to anyone requesting it, to include foreign patents.

Holbrook (J. E. R.) U.S. Bur. Ent. **Apparatus and Method used to remove Pins from Insect Specimens.**—*J. Econ. Ent.*, xx, no. 4, pp. 642–643, 1 fig. Geneva, N.Y., August 1927.

A simple method for removing pins from museum specimens consists of heating the pin by allowing a low voltage of electricity to run through it, and at the same time gently pushing the specimen down with a pair of forceps.

Smith (R. H.). **Concerning Oviposition of the Codling Moth.**—*J. Econ. Ent.*, xx, no. 4, pp. 643–644. Geneva, N.Y., August 1927.

The winter of 1925–26 in California was very mild, and numerous unharvested apples remained on the trees until June and July of the following summer. As they were scarcely shrivelled and gave out a rich odour, it was thought that the adults of the first brood of the codling moth [*Cydia pomonella*, L.] would oviposit on them, but no instance of this was observed, nor was there any apparent tendency to oviposit on the adjacent leaves.

Flanders (S. E.). **Biological Control of the Codling Moth** (*Carpocapsa pomonella*).—*J. Econ. Ent.*, xx, no. 4, p. 644. Geneva, N.Y., August 1927.

A high percentage of the eggs of *Cydia* (*Carpocapsa*) *pomonella*, L., on walnut trees in California was found to be parasitised within two weeks after the liberation of large numbers of *Trichogramma minutum*, Riley, in the spring of 1927, whereas normal egg-parasitism is so light as not to interfere in determining the effect of the liberations. A daily production of 200,000 *Trichogramma* was attained in experimental work started in August 1926 with 10 females bred from eggs of Tortricids, the Angoumois grain moth [*Sitotroga cerealella*, Oliv.] being used as the host.

At a uniform temperature of about 83° F., at which a rapid reproduction of *T. minutum* is obtained, its life-cycle is completed in 8 days.

Cook (W. C.). **A Note regarding the Distribution of the Alfalfa Weevil.**—*J. Econ. Ent.*, xx, no. 4, p. 644. Geneva, N.Y., August 1927.

With reference to his previous paper [*R.A.E.*, A, xiii, 432] on the distribution of the alfalfa weevil [*Hypera variabilis*, Hbst.], the author points out that in attempting to determine the " probable economic distribution " of this weevil he did not intend to imply that it might not occur outside the areas laid down, but merely to indicate the limits beyond which no great damage was likely to be caused. The conclusions arrived at are in no way affected by the recent infestation in eastern Wyoming, where two areas showed slight damage in 1926. A series of mild winters from 1917–18 to 1926–27 has enabled many insects to extend their ranges temporarily in this district.

Chapman (P. J.). **An Introduced Cabbage Weevil.**—*J. Econ. Ent.*, xx, no. 4, p. 645. Geneva, N.Y., August 1927.

Ceuthorrhynchus erysimi, F., is recorded, apparently for the first time, from the United States. Nearly all the plants in a small field of seedling cabbage in New York were destroyed by this weevil, the injury taking place when they were 1–2 inches high. Applications consisting of a dust composed of lead arsenate and hydrated lime, 1 : 4, were moderately effective in preventing injury. *C. erysimi* was also found on a mustard plant in proximity to the cabbage.

This weevil is apparently common in the old world, its distribution including Europe, Asia Minor, Algeria and Siberia, but though the adults have been taken on cruciferous weeds, it has not been previously recorded from cultivated crucifers. Urban has reared *C. erysimi* in Germany from larvae infesting the stems and roots of *Capsella bursa-pastoris* (shepherd's purse). The larvae mature in June and July and enter the soil to pupate, the pupal period lasting 2–3 weeks.

SCHWING (E. A.). **Notes on** *Eutettix tenella* **(Baker) in Northern California, 1927.**—*J. Econ. Ent.*, xx, no. 4, pp. 645–646. Geneva, N.Y., August 1927.

In 1927 enormous numbers of *Eutettix tenella*, Baker, had survived the winter in the San Joaquin foothills, the only permanent overwinter breeding-ground in northern California, and a serious infestation of beet was threatened. About 75 per cent. of the potential infestation, however, was destroyed by heavy rain in March, when the leafhoppers were chiefly in the first and second instars, and by an outbreak of Aphids, which killed the bulk of the short filaree [*Erodium*] in the two areas where most of the eggs were laid. The author has been able to predict the time of flight of *E. tenella* from the San Joaquin valley by observing the increase of the leafhoppers on *Atriplex*, and he has proved that they can migrate as far as 85 miles in one night. In 1926 and 1927 there were three flights in the sections under examination, following upon marked increases in the population in the breeding ground. Owing to the direction of the wind, beet was much more severely infested in some localities than in others. The last increase and the last flight were observed on 12th May, and nymphs began to be abundant about 6th June. A safe date for the planting of late beet can be calculated from these observations.

GAHAN (A. B.) U.S. Bur. Ent. **Description of a new Eulophid parasitic on** *Bucculatrix canadensisella* **Chambers.**—*Psyche*, xxxiv, no. 5, pp. 171–173, 1 ref. Boston, Mass., October 1927.

Pleurotropis bucculatricis, sp. n., is described from Connecticut as a parasite of *Bucculatrix canadensisella*, Chamb.

PHIPPS (C. R.). **The Black Army Cutworm ; a Blueberry Pest.**—*Bull. Maine Agric. Expt. Sta.*, no. 340, pp. 201–216, 2 pls., 21 refs. Orono, Me., May 1927.

The history and distribution of *Agrotis fennica*, Tausch. (black army cutworm) are discussed. It occurs in northern Europe and Siberia and was first recorded from Canada and California in 1874. Since then it has been observed in various parts of the northern United States, the larvae sometimes occurring in very great abundance and attacking many kinds of plants, 40 species being listed. In Maine a serious outbreak was recorded in 1884, and considerable damage was done by this cutworm in 1924, while in 1925 the damage was still more serious, particularly to blueberry (*Vaccinium* sp.), which had not previously been known to be attacked. Other food-plants for which preference was shown included wild raspberry (*Rubus strigosus*), apple, strawberry and common pea. In one county alone the losses to blueberry growers amounted to about £20,000. It is probable that blueberry has been infested by *A. fennica* for a number of years, and that this cutworm has been responsible for damage attributed to frost or other causes.

Descriptions are given of the larva, pupa and adult, and of the larvae of *Euxoa ochrogaster*, Gn. (red-backed cutworm) and *Agrotis unicolor*, Wlk. (W-marked cutworm), which also have the climbing habit and are common in Maine, attacking field and garden crops in the spring. *A. unicolor* occurred on blueberry in company with *A. fennica* in 1925 and 1926.

According to Gibson *A. fennica* has one generation a year in Canada and hibernates in the ground as a partly grown larva. The smallest larvae found by the author in the spring of 1926 were $\frac{5}{8}$ in. long, so that it appears probable that some at least must hibernate as young larvae in Maine. The larvae begin to feed on the first warm nights in late April or early May; in 1925 vast numbers were present during the first week in May, but in 1926, when the infestation was less severe, very few were found until a month later. After feeding for 5–6 weeks the larvae pupate in the ground. The pupal stage lasts 16–24 days, the moths emerging in June and July. No records of when or where oviposition takes place, or of the autumn feeding of the larvae, were obtained. The blueberry fields are burnt over about every three years in the early spring, the heaviest crop being produced in the following year; these newly burnt areas are the only ones attacked by *A. fennica*, but the reason for this is not known. The larvae hide under rubbish or loose soil during the day and climb up the plants to feed at night. They attack the terminal buds first, eating the inside and leaving the bud scales, which turn brown and wither.

Large numbers of larvae of *A. fennica* are eaten by birds, and climatic conditions affect their abundance considerably. According to Gibson several outbreaks of this cutworm in Ontario were largely checked by the fungus, *Empusa virescens*. The following parasites of *A. fennica* have been recorded from various localities: the Tachinids, *Phorichaeta sequax*, Will., and *Phorocera claripennis*, Macq.; the Bombyliid, *Anthrax alternata*, Say; the Therevid, *Psilocephala haemorrhoidalis*, Macq.; and the Braconid, *Meteorus vulgaris*, Cress. The spined soldier bug [*Podisus maculiventris*, Say], the Carabids, *Calosoma calidum*, F. (fiery ground-beetle) and *Harpalus caliginosus*, F., and several species of wasp are predacious on the larvae.

In small fields hand collection of the larvae at night may be of value. Spraying and dusting are not practicable in large fields, as the blueberry foliage grows so rapidly that new, unpoisoned growth is constantly available, and the larvae are somewhat resistant to arsenicals. The most satisfactory control has been obtained with a poison bait, consisting of 20 lb. bran, 1 lb. Paris green or finely powdered white arsenic, mixed dry, 2 U.S. qts. molasses and about 3 U.S. gals. water. The molasses is dissolved in some of the water and the solution is mixed with the dry ingredients, after which more water is added until the whole is evenly moistened but will crumble readily. In gardens the bait should be scattered thinly along infested rows, but in blueberry fields the line of march of the larvae can usually be determined and a good supply of bait can be scattered in front of it every evening until control is obtained ; large quantities would be required for scattering broadcast over whole fields, although it may be advisable to treat localised areas in this way. Other measures commonly employed against cutworms are discussed.

SMITH (R. H.). **Can we vanquish the Codling Moth ?**—*Better Fruit*, xx, no. 8, p. 16, 1 fig. ; no. 8 [*i.e.* 9], pp. 7 & 22, 1 chart ; no. 9 [*i.e.* 10], pp. 7, 13 & 17, 1 chart ; no. 11, pp. 9 & 16, 1 fig., 1 chart. Portland, Oregon, February–May 1926. [Recd. 1927–28.]

In the third article of this series [*cf.* *R.A.E.*, A, xiv, 248] the author discusses the penetration by larvae of the codling moth [*Cydia pomonella*, L.] into apples sprayed with lead arsenate, in relation to the type of spray covering. The spray was applied to the apples through an atomiser either in very fine drops (mist covering), or in larger drops that were just small enough not to run down (coarse covering), or in drops that ran down more or less irregularly (overspray covering), the differences being produced by continuing the application for a shorter or longer time. In all cases some of the larvae entered between the deposits of lead arsenate, but with the coarse and overspray coverings some entered through the thin upper parts of the deposits, while there was a definite tendency to attempt to enter through the edges of the deposits, particularly the lower edge where they were thickest ; this tendency led to a larger percentage being poisoned than would have been expected. It was found that the apparently uncovered spaces between the large deposits of the coarse and overspray coverings are usually covered by small deposits similar to a typical mist covering. On apples on which the lead arsenate was sprayed with a spreader, resulting in a film covering, some of the larvae entered through the film of poison [*R.A.E.*, A, xiv, 488], and the author considers that the most important reason why spreaders have failed to give the expected improvement in control is undoubtedly that the film produced is too thin.

In the remaining articles the author deals with the practical application of the results obtained in these experiments and gives recommendations for the control of *C. pomonella* in areas of heavy infestation, laying stress on the importance of controlling the first generation. He suggests that two calyx sprays should be applied against the first generation instead of one, and that, during the hatching of the first generation larvae, sprays should be applied with sufficient frequency and in sufficient quantity to keep the leaves, fruit and bark thoroughly and heavily coated with lead arsenate. From 3 lb. to 5 lb. lead arsenate to 100 U.S. gals. water should be used in the first cover spray. The most successful form of spray is a fine mist, applied under high pressure and in sufficient quantity to form large drops on the fruit and leaves, but if lead arsenate is used at the rate of 4 lb. or more to 100 U.S. gals. the indications are that the addition of a spreader increases its efficiency, as the film produced is then thick enough. When apples were shaken lightly, immediately after being covered with large drops of spray, about half the poison ran off and nearly twice as many larvae entered the fruit. The spray should therefore not be applied in windy weather, or, if this is necessary, a spreader might prove useful in forming a film, which would not be affected by wind. A spreader may also prove valuable for the calyx sprays ; calyces sprayed with lead arsenate with which 1 lb. spreader to 100 U.S. gals. was used retained twice as much arsenic as others sprayed in the same way without a spreader. Larvae that have escaped the early sprays should be dealt with by picking infested apples and by banding the trees. The picking of infested apples during June (just before the larvae begin to leave them), although seldom practised, has been known to give good results. The larvae that frequently riddle the apples in August, often without previous intimation of their presence, are the offspring of the first generation that escaped the early sprays. The destruction of larvae under burlap bands should be continued until the crop is harvested, in order to reduce the numbers for the succeeding year. If control of the first generation has not been sufficiently effective, further sprays will have to be applied against the larvae of the second generation in August. The indications are that late summer sprays are much less effective than has generally been thought, killing only two or three out of every five caterpillars capable of injuring the fruit. Moreover, the spray residue left on the fruit is another argument against the use of these sprays ; a spreader should in any case be included, as analysis showed that less than one-half the amount of residue remained on apples that had been treated with a spray containing a casein spreader.

DEVER (A. F.). **Oil Spray for Codling Moth tested.**—*Better Fruit*, xx, no. 12, p. 7. Portland, Ore., June 1926. [Recd. 1928.]

In the tests described, Volck oil [a white oil emulsion] was applied as an ovicide against the codling moth [*Cydia pomonella*, L.] at varying strengths (2 to 1½ per cent.) to about 120 apple trees, the rest of the orchard being sprayed with 3 lb. lead arsenate and 1 lb. spreader to 100 U.S. gals. water. The whole orchard had previously received a calyx spray of lead arsenate.

The oil was first applied on 7th May, and when six trees were examined a week later, one live larva and one " sting " were found. As a considerable quantity of fresh eggs had been laid and were ready to hatch, another application of the oil was made. Next day the most advanced eggs had been killed, and only two larvae and two " stings " were found on 14 trees. On the plots treated with lead arsenate only, several larvae were found on the few trees examined, and a larger number of fresh eggs had been laid. The results of both field and laboratory tests indicate that the 1½ per cent. oil emulsion is an effective ovicide and will kill the larvae in the egg even at the point of hatching. The effect of the emulsion does not depend so much on the oil content of the spray as on the amount applied to the fruit.

The Relation of Insects to Slash Disposal.—*Dept. Circ., U.S. Dept. Agric.*, no. 411, 12 pp., 17 refs. Washington, D.C., September 1927.

The question of the possible menace of insect infestation to standing timber as a result of cutting and clearing operations has been much discussed and has given rise to considerable diversity of opinion. This paper has been compiled by various entomologists of the Division of Forest Insect Investigations of the United States Bureau of Entomology with a view to setting forth the present knowledge with regard to the entomological importance of slash disposal, though it is realised that general statements applying indiscriminately to all forest regions are out of the question and that the problem varies with each forest, region and type. Of the hundreds of insects that breed in slash, very few species are capable of injuring living trees, while many of them are definitely beneficial in that they hasten decomposition of the medium in which they live. Hardwood trees need not be considered, as practically no insects that breed in hardwood slash are of importance as tree killers, so that the problem is limited to pines, spruces and Douglas fir (*Pseudotsuga taxifolia*).

White pine (*Pinus strobus*) is seriously injured by *Hylobius pales*, Hbst., which breeds in slash in the north-eastern States. The adult weevil gnaws the bark off young trees, frequently girdling them, and seriously hindering regeneration of stands of white pine. Burning or peeling the bark off cull logs or stumps or thoroughly charring the stumps may lessen the damage somewhat, but will not decrease the attractiveness of the slash, which is probably the greatest source of danger. The recommendations are to obtain reproduction, by means of reproduction cutting, of sufficient healthy seedlings to produce a stand after the destruction caused by the weevil, and to practise clear cutting followed by planting after an interval of three years. Both *P. strobus* and *P. resinosa* (red pine) in the Great Lakes region are attacked by *Dendroctonus valens*, Lec., which seldom breeds in parts of the tree more than 6–8 feet above the ground. All recorded cases of injury caused by this beetle to standing trees have been associated with the attractive influence of logging operations, windfalls, fires or logs in storage. It only breeds in the larger parts of slash, as do *Ips calligraphus*, Germ., attacking white pine and *I. pini*, Say, which is a primary pest of both red and white pines. Heavy shade is unfavourable to these species, and the simplest remedy is to cover the stumps and larger pieces of slash with the smaller pieces. Stumps so covered were found to contain only an average of 4 mother tunnels of *D. valens* as compared with an average of 40 in uncovered ones.

P. monticola (western white pine) in the northern Rocky Mountain region is chiefly attacked by *D. monticolae*, Hopk. (mountain pine beetle), which breeds in cull logs from logging operations. If it should happen that any quantity of such material were left in the woods for a length of time, the bark should be peeled off infested logs before the beetles emerge in order to prevent damage to standing trees. Two smaller insects, *Pityogenes carinulatus*, Lec., and *P. knechteli*, Sw., breed in the smaller slash from the tops of the trees and occasionally attack and kill young white pines. *D. monticolae* also attacks *Pinus lambertiana* in the Pacific Coast region, breeding in cull logs and standing trees, but slash is not of much importance in connection with it.

Infestation of *P. ponderosa* in Oregon by *D. brevicomis*, Lec. (western pine beetle) has recently been discussed [*R.A.E.*, A, xvi, 30], and the same considerations apply to California. In the Rocky Mountain and Pacific Regions this tree is attacked by *D. valens*, which breeds in stumps and butt logs, but only infests the base of live trees to a limited extent. In the southern Rocky Mountain and Colorado Plateau regions *D. ponderosae*, Hopk. (Black Hills beetle) is the principal pest of *P. ponderosa* var. *scopulorum*, and it is found that felled logs and culls act as traps for the beetles during the flight period. The cull logs and tops are favourable for the breeding of certain *Acanthocinus* borers and predatory species that are detrimental to the development of *Dendroctonus*, and as these enemies increase they tend to concentrate on standing trees that are attacked, thus holding the infestation in check. The disposal of the heavier slash, under these conditions, is injurious rather than beneficial to the standing timber.

P. jeffreyi in California is frequently attacked by *D. jeffreyi*, Hopk. (Jeffrey pine beetle), especially in stands adjacent to large areas where windfalls are numerous ; such epidemics are, however, sporadic and seldom warrant remedial measures. Lodgepole pine (*P. murrayana*) is often seriously injured by *D. monticolae*, which may kill thousands of acres of standing trees. This insect is strongly attracted to the vicinity of logging and clearing operations but seldom attacks felled trees. The disposal of slash does not reduce the number of beetles, and the concentration caused by clearing operations seems to be unavoidable. *D. murrayanae*, Hopk., also attacks lodgepole pine and has the same habits as *D. valens* in *P. ponderosa*. Monterey pine (*P. radiata*) in California is frequently infested by *Ips* spp. in the neighbourhood of clearings, and *D. valens*, which usually breeds in stumps, sometimes becomes a primary pest of this tree. Owing to the value of this pine, special precautions with regard to slash disposal should be taken.

Pines in the south are chiefly attacked by *D. frontalis*, Zimm., *Ips calligraphus*, *I. avulsus*, Eichh., and *I. grandicollis*, Eichh., the first infesting mostly living trees, while the others are generally found in tops, cull logs and stumps, but all are associated in the destruction of standing pines. Slash does not constitute a serious menace as a medium for the breeding of these insects, but logging or clearing operations in the summer should be avoided wherever possible owing to the strong attraction of the beetles to such areas.

Spruces (*Picea canadensis*, *P. rubens* and *P. mariana*) in the north-east are attacked by several bark-beetles, *D. piceaperda*, Hopk., which breeds in stumps and cull logs being particularly destructive, especially when associated with *Ips* spp. *I. borealis*, Sw., *I. perturbatus*, Eichh., and *I. chagnoni*, Sw., breed in slash, and have been known to kill neighbouring trees in the following year. The cull logs and larger slash are by far the more dangerous source and should not be left in the woods, but the more rapid utilisation of felled timber in the region in question owing to the development of the pulp industry will undoubtedly minimise the danger. *P. engelmanni* in the Rocky Mountain region is attacked by *D. engelmanni*, Hopk., which breeds in the culls and stumps, but little timber is as yet being cut in this region.

Douglas fir is occasionally killed by insects that breed in the larger slash, such as *D. pseudotsugae*, Hopk., *Scolytus unispinosus*, Lec., and the Buprestid, *Melanophila drummondi*, Kirby. Along the Pacific coast the danger to living trees is almost negligible (probably on account of continuous logging operations), but on the coast of British Columbia serious damage has been caused to Douglas fir in the neighbourhood of logging operations. In the Rocky Mountain region, *D. pseudotsugae* is apparently much more aggressive than in the more humid regions. *S. unispinosus* and *Pseudohylesinus nebulosus*, Lec., occasionally breed in slash and in default of other material will attack young trees. The destruction of Douglas fir by insects needs further study before conclusions can be drawn.

In general, it is found that the majority of important tree-killing insects that attack slash breed chiefly in cull logs and butts, so that the present methods of brush burning have little influence on their control. No method of slash disposal will prevent the attraction of insects that may concentrate on standing timber in the vicinity of cutting operations, and logging operations on valuable sites should be restricted to the autumn or winter, at least two months before the growing season. Insects of secondary importance breeding in slash and occasionally causing injurious outbreaks produce only sporadic infestations and do not warrant special methods of slash disposal.

Hopping (G. R.). **Studies in the Life History of** *Trachychele blondeli* **Mars. (Coleoptera).**—*Canad. Ent.*, lix, no. 9, pp. 201–204. Orillia, Ont., September 1927.

Studies of the life-history of the Buprestid, *Trachykele blondeli*, Mars., which has been causing damage to western red cedar [*Thuja plicata*] on the coast of British Columbia were carried out in 1925 and 1926. The adults emerge from 10th May to 10th June, and oviposition begins from 15th June to 15th July. The eggs are laid on the upper side of the branches, not more than 3 ft. from and generally within 1 ft. of the trunk, and are placed as deeply as possible beneath the bark near the cambium. The method of oviposition is described, the number of eggs laid by one female under observation being estimated at between 15 and 20. The period of incubation varies between 14 and 20 days. The larvae tunnel in the branch and trunk and are found in all parts of the tree above the ground level ; though the exact time spent in the larval stage is still uncertain, it is known to be at least three years. Pupae may be found from the middle of July to the middle of September, and the adults remain in the pupal cells until the following year. The pupae occur in all sections of the trunk and sometimes in the larger limbs, generally not more than 1 ft. from the trunk.

Weiss (H. B.). **Results of the Seventh Year's Work against the Gipsy Moth in New Jersey.**—*Circ. New Jersey Dept. Agric.*, no. 127, 12 pp., 7 figs., 1 map. Trenton, N.J., August 1927.

This report on the control of the gipsy moth [*Porthetria dispar*, L.] records the work accomplished during 1926–27.

Dodge (B. O.) & Wilcox (R. B.). **Diseases of Raspberries and Blackberries.**—*Fmrs.' Bull. U.S. Dept. Agric.*, no. 1488, 32 pp., 20 figs., 1 ref. Washington, D.C., June 1926. [Recd. 1927.]

The more important fungous and virus diseases of raspberries and blackberries occurring in the United States are described, with recommendations for their control. The virus diseases are transmitted by Aphids, those concerned on raspberries being *Aphis rubiphila*, Patch, and *Amphorophora rubi*, Kalt.

Brinley (F. J.) & Baker (R. H.). **Some Factors affecting the Toxicity of Hydrocyanic Acid for Insects.**—*Biol. Bull.*, liii, no. 3, pp. 201–207, 4 figs., 1 ref. Woods Hole, Mass., September 1927.

The technique employed in these experiments and the apparatus by means of which it was possible to regulate and check the temperature and humidity are described. Granular calcium cyanide was used as a source of hydrocyanic acid gas. The results of experiments with

Aphis rumicis, L., *Macrosiphum* (*Macrosiphoniella*) *sanborni*, Gill., and *Thrips tabaci*, Lind., indicate that within certain limits, lethal concentration and length of exposure are inversely related. Beyond a period of 15 minutes, however, the concentration is apparently independent of the time, as it takes practically the same concentration to kill in an hour as it does in 30 minutes.

As would be expected, the increase of metabolic functions due to a rise in temperature result in an increase in susceptibility of the insect to hydrocyanic acid gas. The effect of temperature is more pronounced with shorter exposures. Young Aphids and winged adults are more susceptible than the wingless forms, a fact that coincides with Child's observations that the physiologically young organisms have a higher rate of metabolism than the older animals and are more susceptible to cyanide. In the case of the thrips, however, the adults appear to be more easily killed than the young.

In the humidity experiments *A. rumicis*, *Calandra* (*Sitophilus*) *granaria*, L., and *C.* (*S.*) *oryzae*, L., were used. The results indicate that humidity is not an important factor in determining the toxicity of hydrocyanic acid gas.

A comparative study showed that the mixed gas resulting from the action of water vapour on calcium cyanide is slightly less toxic than the pure hydrocyanic acid gas produced from liquid HCN. The gas produced by the hydrolysis of calcium cyanide contains other compounds, such as ammonia and hydrogen sulphide, in addition to hydrocyanic acid gas. These compounds have been added to the gas arising from liquid HCN, the results showing that there is some antagonistic action between ammonia, hydrogen sulphide and hydrocyanic acid gas, which lowers the toxicity of the latter.

As certain insects, such as *Melanoplus differentialis*, Uhl., close their spiracles when placed in a sublethal concentration of hydrocyanic acid gas, it was thought that if some chemical that would keep the spiracles open could be mixed with the gas the insects would be more easily killed. Methyl acetate was tested in this connection, the only insect available being *C. granaria*. It was not determined whether or not these weevils close their spiracles, but when methyl acetate was added to the liquid HCN the average mortality was 77·4 per cent., as compared with 59 per cent. when pure HCN was used.

TAYLOR (R. L.). **Notes on the Mite** *Pediculoides ventricosus* **Newport.**—*Psyche*, xxxiv, no. 3–4, pp. 157–163, 2 figs., 8 refs. Boston, Mass., June–August 1927.

Pediculoides ventricosus, Newp., has frequently been considered beneficial, as it destroys many pests, particularly those attacking cereals. It is here suggested, however, that it is more harmful than is realised, as it also attacks beneficial insect parasites. Considerable losses are occasioned by this mite in laboratory rearings of parasites ; an attack on *Eurytoma pissodis*, Gir., a Chalcid parasite of *Pissodes strobi*, Peck., is described.

DAVIN (A. G.). **Infestation of Flax Seed by Mites.**—*Linen Ind. Res. Ass., Res. Inst. Mem.* 31, pp. 45–52, 4 pls., 4 refs. [Lambeg, Co. Antrim.] January 1926. [Recd. 1927.]

The appearance of " minty seed " in flax is familiar, but it is not generally known that this condition is due to the presence of mites.

An enquiry undertaken to ascertain the various species present and the exact injury they cause to the seed resulted in the discovery of *Tyroglyphus longior*, Gerv., which was the most common, *T. siro*, L., *T.* (*Aleurobius*) *farinae*, DeG., which is most commonly found in flour, and *Glyciphagus cadaverum*, Schr. These mites prefer the dark and are thus difficult to exterminate completely from barns, sheds, etc. They are not injurious to man and an irritation experienced by those handling the seeds is due to *Cheyletus eruditus*, Latr., which is predacious on these species [*R.A.E.*, A, vii, 91].

In the case of wheat it has been shown [*loc. cit.*] that *T. farinae* bores a hole in the seed coat and enters and devours the tissues. The author, however, describes extensive experiments showing that none of the four mites under discussion can attack healthy flax seed ; they only live on broken seeds, which in any case do not germinate. They also do no harm to plants when introduced into the soil with the seed. It was found that these mites cannot live in dry seed, and though the percentage of moisture required varies with the species, their presence may be regarded as a sign that the moisture content of the seed is dangerously high, its germination being very seriously affected if it becomes damp. It is possible that these mites may cause heating of the seed [*R.A.E.*, A, xiii, 84], and though they have not been proved to do any direct harm to it, it is considered desirable to keep it uninfested, if only because conditions favourable to the mites are unfavourable to the seed. The minimum amount of broken seed should therefore be stored, and it should be kept as dry as possible. If harvesting conditions are bad, it should be dried artificially and great care should be taken that the rollers are adjusted so that as few seeds as possible are crushed during dressing.

The most effective method of destroying mites is to heat the seed to a temperature of about 104° F., for 24 hours ; on a large scale, however, it is cheaper and more convenient to use insecticides. Paradichlorobenzene has been found to be the most effective and is not injurious to the seed in any way ; a small bag containing ½ lb. is sufficient to keep a 2 cwt. sack of seed free from infestation throughout the winter, and to overcome emerging larvae at once. Wherever possible, however, the crystals should be mixed with the seed while it is being dressed. Copper carbonate dust has lately been tried with promising results, but must be taken internally to harm the mites. It has been proved that *T. farinae* and *G. cadaverum* can live for a considerable time without food, and this enables them to wander away from the proximity of the dust.

An Outbreak of *Bourletiella hortensis* on Clover in Australia.

Mr. G. F. Hill, Entomologist to the Commonwealth Council of Scientific and Industrial Research, in a letter dated 19th December 1927 states that a Collembolan, *Bourletiella hortensis*, Fitch, which has been identified by Dr. G. H. Carpenter, has recently been found in immense numbers attacking clover at Leongatha, Victoria. This appears to be the first record of this species from Australia, though Dr. Carpenter has noted it from New Zealand.

DOHANIAN (S. M.). **Preliminary Experiments for the Control of certain European Vine-moths by Fumigating with Cyanogas Calcium Cyanide.**—*Psyche*, xxxiv, no. 3–4, pp. 146–156, 2 refs. Boston, Mass., June–August 1927.

Preliminary experiments with cyanogas calcium cyanide " A " dust in France and Switzerland indicate the possibilities of this method in the control of the vine-moths, *Clysia ambiguella*, Hb., and *Polychrosis botrana*, Schiff. Both insects pass the winter as pupae in rather thick cocoons, which are usually attached to the vine stalks or stakes, though at times they have been found in sheltered positions on rocks, fences, etc.

The applications were made during the dormant season in late winter and early spring. As the insects at this time are protected by their cocoons, open air fumigation would be ineffective, and the experiments were made under a heavy, impermeable canvas tent large enough to cover four vines at once or under a cylindrical galvanised iron can. The latter was 95 cm. high, with a diameter of 60 cm. and a cubic content of 270 litres. It was found that 12·5 gms. of calcium cyanide would produce a 1 per cent. volume concentration of hydrocyanic acid gas in the can. The concentrations used varied from 0·275 per cent. to 10 per cent. volume, each dosage being tried at least twice with a given exposure. The exposures varied from 30 minutes to 3 hours. Both young and old vines can safely withstand concentrations of 10 per cent. for 45 minutes during the dormant season ; such applications made just before the flow of sap began (25th March) only retarded the growth of the plants.

The tin can proved more satisfactory than the tent, as it is more airtight and because the temperature under it rises during fumigation, which is more effective above 60° F. Temperature appears to be of greater importance than a high relative humidity. All pupae were killed by concentrations of gas varying from 2 to 3·5 per cent. at exposures ranging from 3 hours to 1 hour respectively. Higher or lower concentrations with shorter or longer exposures respectively were less satisfactory.

MUNGOMERY (R. W.). [**Reports of the Southern Assistant Entomologist, May-September 1927.**]—*Qd. Agric. J.*, xxviii, pts. 2–4, pp. 104–106, 220–221, 337–338. Brisbane, 1st August–1st October 1927.

The red patches that occur along the mid-ribs of sugar-cane leaves at almost any period of the year have no relation to the " gum streaks " that are commonly referred to as a means of identifying the gumming disease of sugar-cane. They are caused by the oviposition punctures of numerous species of leafhoppers, and such plants as *Sorghum* are similarly affected. In southern Queensland the principal leafhopper associated with cane is *Perkinsiella saccharicida*, Kirk., and it seems, moreover, to be the only species in this locality that punctures the midrib for oviposition. During the processes of oviposition and hatching of the nymph, the plant tissues are broken, permitting the entrance of fungus spores that subsequently cause the reddening referred to. At most this fungus may cause a slight interruption in the flow of cell sap, and such injury is usually regarded as being of minor importance. A Chalcid, *Paranagrus optabilis*, Perk., has been bred from the eggs of *P. saccharicida*. The Elachistid, *Cosmopteryx*

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dulcivora, Meyr., injures the midrib of cane leaves by making irregular tunnels that also become reddened, but this moth has not been observed south of Mackay.

Owing to heavy rains early in the year an excellent growing season was anticipated and the idea of fumigating the soil of cane fields with carbon bisulphide or paradichlorobenzene against *Lepidoderma albohirtum*, Waterh., was temporarily abandoned by growers, with the result that severe damage was done in some localities by the grubs, which are capable of causing extensive injury in wet seasons as well as in dry ones.

Although most of the insects that are serious pests of cane in neighbouring cane-producing areas are present in the Bundaberg district, this area is at present comparatively free from damage by them, and it is suggested that this is largely due to the scattered nature of the farms, which are situated close to large stretches of scrub and forest that provide shelter for insectivorous birds.

On a few cane fields the small mound-building ant, *Aphaenogaster longiceps*, Sm., caused a severe stunting of the cane stools. It is probable that the ants do not eat the roots, but break off the root hairs and pit the roots while constructing their galleries, and thus interfere with the food-supply of the plant [*cf. R.A.E.*, A, xiv, 206]. The soil honeycombed by the galleries is much drier than is normal. These ants are associated with subterranean Delphacids, Jassids and an unidentified Aphid that suck the cane roots and weaken the plant. Carbon bisulphide at the rate of $\frac{1}{4}$ oz. injected twice to each side of the cane stool has given the most promising results as a control for this ant, which is not a serious pest and appears unlikely to spread to any great extent.

Jarvis (E.). **Cane Pest Combat and Control.**—*Qd. Agric. J.*, xxviii, pts. 2–4, pp. 108–110, 211–212, 339–341. Brisbane, 1st August–1st October 1927.

Experiments have shown that when treating very young plant cane growing in friable soil with paradichlorobenzene during midsummer in dry weather, injections should not be made nearer than 5 to 6 inches from the plants. Older cane 3 to 4 feet high is not injuriously affected by this fumigant or carbon bisulphide, although the latter will sometimes check the growth of the plant for a few weeks if injected into the centre of a big cane stool.

The small grubs turned up in the furrows when forest country is being prepared for early planting with cane are probably the second stage larvae of *Lepidiota frenchi*, Blackb., and should be collected during June before they go down out of reach of the plough to pass the colder months, since the third stage larvae may cause severe damage to young plant cane in September and October. When the soil is too wet to fumigate the colonies of ants round cane stools and tree-trunks the use of a poison bait is recommended [*R.A.E.*, A, viii, 285].

The influence of topographical features, prevailing winds and position of feeding trees on the migration of *Lepidoderma albohirtum*, Waterh., is further discussed [*R.A.E.*, A, xv, 662]. Notes are given on the pupa of *L. albohirtum* [*R.A.E.*, A, ix, 531]. The structure of the spiracles is discussed in connection with the high percentages of mortality obtained by fumigation.

JARVIS (E.). **Cane Beetles and Climate.**—*Qd. Agric. J.*, xxviii, pt. 2, pp. 110–113, 2 figs. Brisbane, 1st August 1927.

The history of outbreaks of *Lepidoderma albohirtum*, Waterh. (grey-back cockchafer) in Queensland in relation to rainfall is reviewed [*cf. R.A.E.*, A, xv, 176]. The season of 1926–27 proved more favourable to the beetle than the previous one, and the injury was more widespread. This was due to the unusually wet weather during the egg and early larval stages (November 1926–May 1927), and the adverse conditions that occurred during the pupal stage (June–October 1926) were not severe enough to counteract this. Should the rainfall be normal during July–December 1927, a severe outbreak may be expected during the 1927–28 season.

JARVIS (E.). **Entomological Hints to Canegrowers.**—*Qd. Agric. J.*, xxviii, pt. 2, pp. 114–115. Brisbane, 1st August 1927.

Recommendations are made for controlling Elaterid larvae (wireworms) attacking sugar-cane in Queensland [*R.A.E.*, A, xiii, 521; xv, 176]. The formula recommended for the bait along the furrows consists of 25 lb. bran, 1 lb. Paris green and $\frac{1}{8}$ oz. nitrobenzene. Sliced carrots and potatoes cut on one side and set in the soil may be used as traps. Fumigation with 100 lb. calcium cyanide granules or 22 gals. benzine to the acre is also satisfactory, if used in conjunction with a trap crop of germinating cowpeas, etc. [*cf. R.A.E.*, A, xiv, 639].

The larvae of *Melanitis leda*, L., and *Padraona marnas*, Feld., appear to be increasing, causing noticeable though not serious damage to young sugar-cane leaves.

VEITCH (R.). **Some Hawaiian Experiments in the Biological Control of Insect Pests.**—*Qd. Agric. J.*, xxviii, pt. 2, pp. 145–148. Brisbane, 1st August 1927.

The value of biological control for the suppression of introduced insect pests is discussed, and examples of the success of this method against sugar-cane pests in Hawaii are given.

JARVIS (E.). **The Greyback Cockchafer.**—*Qd. Agric. J.*, xxviii, pt. 3, pp. 212–215, 1 pl. Brisbane, 1st September 1927.

The range of flight of [*Lepidoderma*] *albohirtum*, Waterh. (grey-back cockchafer) has not been studied to any extent, but it is suggested that the females when ready to oviposit would not travel more than about $\frac{1}{2}$–$\frac{3}{4}$ mile, or about the same distance under similar circumstances as the common European cockchafer, *Melolontha melolontha*, L.

BALLARD (E.). **Some Notes on Cutworms in Cotton.**—*Qd. Agric. J.*, xxviii, pt. 3, pp. 229–233, 1 map. Brisbane, 1st September 1927.

At the beginning of the cotton season of 1926–27 a marked and widespread outbreak of the cutworm, *Euxoa radians*, Gn., occurred in Queensland. Other crops were also damaged and considerable loss was occasioned. At the Research Station, Biloela, the outbreak was brought to an end by poison baits. The baits used were, however, apparently too tough for the young larvae, which fed in masses and attacked the cotyledons almost as soon as they unfolded above ground.

As a rule the latter half of the larval stage of cutworms is the most injurious. During the summer, the life-cycle from egg to adult occupied 7 weeks, of which 30 days were passed as a larva. The conditions favouring hibernation and its duration are not known. The eggs are never laid on or under the cotton plant; moisture in the soil and a certain amount of protection, such as is afforded by weeds, are essential conditions, so that infestation of a clean field would be due to invasions from headlands, etc. During this outbreak ratoon cotton was badly damaged before the cutworms moved to the plant cotton. It has previously been stated that ratoon cotton is not attacked.

The bait formula recommended is 25 lb. bran, 1 lb. Paris green and 1 qt. molasses.

Corbett (G. H.) & Dover (C.). **The Life-history and Control of some Malayan Insects of Economic Importance.**—*Malayan Agric. J.*, xv, no. 7, pp. 239–270, 5 pls., 17 refs. Kuala Lumpur, July 1927.

This paper, which is in three parts, deals with the Lymantriid, *Notolophus* (*Orgyia*) *turbatus*, Butl., the Cassidid, *Aspidomorpha miliaris*, F., and the Clerid, *Necrobia rufipes*, DeG. The stages of the pest are described in each case, and the systematic position and distribution are discussed.

N. turbatus shows a preference for mimosa (*Mimosa pudica*) and *Centrosema plumieri*, but will feed on other plants and is a potential pest of rubber, to which it has been known to migrate in several instances in Malaya. Some general observations are made on the migration of insects from cover and other crops to rubber and coconuts, and it is suggested that the cultivation of certain cover crops may be a dangerous practice. The life-cycle of *N. turbatus* is completed in about a month. The eggs are laid in masses containing 250–300 eggs, or in some cases as many as 450. Details of the first and second generations under laboratory conditions are shown in tables. Sexual differences in the larva and the pupa, habits and parasites are also noted. The larvae are particular in their choice of food in the early instars, but become less so towards the end of the larval period, when they may be injurious to rubber. It appears that increased palatability of food results in a longer life-cycle. On the other hand, a quick life-cycle increases the possibility of the larvae surviving the disadvantages occasioned by the unhealthy food, which hastens development. Control measures are based on the fact that the natural spread of the species is limited to the migration of the larvae, the female being wingless. A poisoned barrier, within which the larvae may be confined, can be formed by spraying the food-plants with 2 lb. lead arsenate in 50 gals. water at the limits of the last advance of the pest. The eggs, larvae and female moths within the affected area should be collected and destroyed. The weeding out of cover crops has also proved successful in eradicating the moth.

Aspidomorpha miliaris, the Malayan form of which appears to be a distinct variety, is not uncommon on certain Convolvulaceae and may become an important pest of sweet potato (*Ipomoea batatas*). The recorded food-plants of this beetle include *Calonyction bona-nox* and several species of *Ipomoea*. The life-history is described, the average of the total life-cycle being about 40 days. A single female may give rise to 350 larvae. A Proctotrupid egg-parasite, which completes its life-cycle in 14 days, destroys many of the eggs. *A. miliaris* can generally be effectively controlled by hand-picking, but in the case of severe infestation the lead arsenate spray mentioned above has proved successful.

Necrobia rufipes is a pest of copra and other stored products. While the life-cycle, which in Malaya appears to average 100 days, though it may vary considerably, has been completed under laboratory conditions on copra, both larvae and adults are predacious. Details of the life-history are compared with observations in the United States [*R.A.E.*, A, xiii, 129, 508]. The most successful control measure is fumigation in air-tight chambers with hydrocyanic acid gas (1 oz. 98 per cent. potassium cyanide, 1 oz. commercial sulphuric acid, 1·84 sp. gr., and 3 oz. water to 100 cu. ft.). Damp and mouldy copra is conducive to the breeding of the beetle, while copra from old nuts is less liable to attack than that from young and insufficiently dried nuts. If copra is not stored near dwellings, where the beetles may cause annoyance, it should be constantly turned over to disturb them. Periodic fumigation under tarpaulins with carbon bisulphide (15 lb. to 1,000 cu. ft.) is a useful alternative measure.

FAES (H.). **Le phylloxéra gallicole.**—*Prog. agric. vitic.*, lxxxviii, no. 43, pp. 400–402, 1 ref. Montpellier, 23rd October 1927.

The results of experiments in Switzerland in immersing vines for 12 hours in a solution of potassium sulpho-carbonate [*R.A.E.*, A, xi, 187] for the destruction of the winter eggs of *Phylloxera* were inconclusive during 1925 and 1926, as even the untreated plants were not infested by the gallicolae, but during 1927 the success of the method was established, as the treated plants were free from infestation while neighbouring untreated ones were severely attacked. In field experiments the plants were sprayed, after pruning, in February–March with either lime-sulphur, 1 : 4, or with a 4 per cent. solution of crude lysol. The sprayed plants were free from gallicolae, whereas the unsprayed ones were heavily infested. Treating the trunks of both grafted and non-grafted stock with lysol is, therefore, advised; the experiments with lime-sulphur were not continued long enough for recommendations to be made.

ALLMAN (S. L.). **The Codling Moth** (*Cydia pomonella*, **L.**).—*Agric. Gaz. N.S.W.*, xxxviii, pts. 7–9 & 11, pp. 551–556, 624–631, 699–706, 861–872, 11 figs., 3 refs. Sydney, July–September and November 1927.

Doubt has lately been expressed [*R.A.E.*, A, xiii, 429] as to the efficacy of lead arsenate in controlling *Cydia pomonella*, L. Experiments were carried out with seven different sprays, applied at a pressure of 175–200 lb. to the square inch, six applications being made, *viz.*, two calyx sprays at intervals of a week and four cover sprays at intervals of five weeks, the first being applied three weeks after the second calyx spray. Lead arsenate at the rate of 36 oz. to 50 gals. water was the most effective spray, killing 54 per cent. of the larvae attempting to enter the apples as compared with 46 per cent. killed by lead arsenate at 18 oz. to 50 gals. water, the strength usually employed. These figures allow for a natural mortality of 16 per cent., but do not allow for larvae killed before reaching the apples, and may be considered as representing the minimum effectiveness. Sprays containing other materials, alone or in combination with lead arsenate, were less effective. Severe scorching of the foliage resulted from the use of sodium arsenite at the rate of $\frac{1}{48}$ oz. to 1 gal. water, while 18 oz. lead arsenate with $12\frac{1}{2}$ oz. white arsenic to 50 gals. water caused slight scorching, and 18 oz. lead arsenate with $1\frac{1}{2}$ gals. lime-sulphur to 50 gals. water gave a pronounced spray residue, necessitating washing the fruit. The calyx sprays were more effective than the cover sprays ; on the unsprayed plot 28 per cent. of the fruit was infested through the calyx cup and 64 per cent. through the side, while on the plot, sprayed with 18 oz. lead arsenate to 50 gals. water 1·6 per cent. of the fruit was infested through the calyx cup and 40 per cent. through the side.

All the trees were banded, and the bands were examined at least every 7 days throughout the season, all windfall fruit being collected and examined at the same time. During the season, 2,492 larvae were caught in the bands, these being estimated to be 74 per cent. of those that matured. The majority of the larvae do not drop to the ground, but descend the main limbs of the trees to pupate, and in order that banding may be effective, care should be taken that hiding places in rough bark are not overlooked. The importance of the destruction of windfalls is shown by the fact that 6,884 larvae were found in those collected. Infested fruit should only be stored if adequate precautions have been taken to prevent moths developing from the larvae that it contains from escaping.

A detailed study of the life-history of *C. pomonella* was made in order to make the correct timing of sprays possible. There are two pronounced broods in a year, but only a partial third, as about 95 per cent. of the second brood larvae hibernate, as do all those of the third brood, and a few of the first. There is a considerable overlapping of broods : the moths of the spring brood (from hibernating larvae) emerged between 9th October and 9th January, and those of the first brood between 18th December and 19th February, and began to oviposit after about 9 and 3 days respectively. About 74 per cent. of the eggs of the first brood were laid on leaves or twigs, and only 26 per cent. on the apples ; where apple and pear were grown together the eggs of the first brood were laid almost exclusively on apple, but those of the second equally on both. In the first brood the average incubation period was 10 days, feeding period of larvae 29 days, time from emergence of larvae from fruit to pupation 7 days, and pupal period 15 days. The corresponding periods for the second brood were 8, 23, 6 and 15 days. The great majority of the larvae of the second brood, however, hibernated, and these fed for an average of 28 days, the time from their emergence from the fruit to pupation varying from 154 to 233 days, with an average of 191 days. The larvae hibernated on the trees under rough bark and in crevices, and in some cases below the surface of the soil at the foot of the tree.

Larvae in apples that fall to the ground usually remain in them until full-fed, being able to mature in fruit less than one inch in diameter. Although larvae were found feeding on the foliage, it is improbable that they can mature on such food.

The most important parasite was *Trichogramma australicum*, Gir., which destroyed about 27 per cent. of the eggs towards the end of the season. The Chalcid, *Stomatoceras pomonellae*, Cam., and a

Proctotrupid, *Parasierola* sp., were bred from the larvae, the latter being an external parasite. Predators included *Chrysopa* sp., which destroyed eggs in the laboratory and probably also in the field, the Dermestid, *Trogoderma froggatti*, Blkb., attacking the pupae, the larvae of a Melyrid, *Carphurus* sp., reported as attacking the larvae, and *Iridomyrmex detectus*, Sm. (mound ant), which attacked any exposed larvae, those making their way from windfalls to the trunks for pupation being most liable to be found by it.

GURNEY (W. B.). **Wood Borers. Powder-post and Furniture Beetles.**—*Agric. Gaz. N.S.W.*, xxxviii, pt. 9, pp. 686–688, 3 figs. Sydney, September 1927.

The bulk of this information has been noticed from a more detailed paper [*R.A.E.*, A, xiii, 228]. Wood attacked by *Lyctus brunneus*, Steph. (powder-post beetle), should be treated about November when the adults emerge, and if necessary at the same period the following year. *Anobium domesticum*, L. (furniture beetle) favours soft or medium soft woods, notably white pine. It is more persistent than *L. brunneus*, reproducing and causing repeated attacks, and spreading readily to adjacent pine wood and furniture. Treatment for *A. domesticum* should be made in November; directly emergence holes appear in valuable furniture, however, the liquids should be injected as recommended, daily for a week or two. All stages of the beetle are killed in wood an inch thick if it is heated to a temperature of 135° F., for three-quarters of an hour; a longer period is necessary for thicker woods.

McCARTHY (T.). **The Control of the Fruit Fly. Experiments with the Poison Foliage Bait.**—*Agric. Gaz. N.S.W.*, xxxviii, pt. 9, pp. 710–714. Sydney, September 1927.

Experiments with the poison foliage bait as a control for *Dacus ferrugineus*, F. (*Chaetodacus tryoni*, Frogg.) (Queensland fruit-fly) and *Ceratitis capitata*, Wied. (Mediterranean fruit-fly), were carried out on orange trees in New South Wales in 1925. On *Citrus*, however, the loss of fruit due to these pests only amounts to about 0·9 per cent., so that the results gave no real guide to the value of the method as a control. It is nevertheless suggested that the bait now recommended be applied to *Citrus* for five weeks prior to the colouring of the fruit; this will kill flies that have bred in late stone-fruits and then transferred their attack to *Citrus*. Late stone-fruits are very susceptible to attack, and experiments, details of which are given, were therefore carried out on late peaches in a locality near the coast where *D. ferrugineus* and *C. capitata* mostly occur.

The results show that the spray recommended [*R.A.E.*, A, xv, 175] applied every seven days will protect trees from this pest. Applications should be started five weeks before the fruit is harvested. As a rule it will be found that 6–8 fluid oz. to a tree will be necessary.

In stone-fruit orchards the best results can be obtained by spraying the trees progressively as the various fruits ripen; this means of control should, however, be supplemented by good cultivation and the removal of fallen fruit. The fruit-fly prefers to lay eggs in the ripening fruit; the practice of marketing it unripe, therefore, avoids losses that would otherwise be incurred.

JARVIS (E.). **Notes on Insects damaging Sugar Cane in Queensland.**—*Bull. Bur. Sug. Expt. Stas. Qd.*, Div. Ent. no. 3, 2nd edn. revd., 94 pp., 7 pls., numerous figs. Brisbane, 1927.

This is a revision of a bulletin previously noticed [*R.A.E.*, A, iv, 344]. Of the 44 species recorded as pests those not mentioned in the first edition are *Mastotermes darwiniensis*, Frogg., *Ephysteris chersaea*, Meyr., *Rhyparida limbatipennis*, Jac., *Coptotermes acinaciformis*, Frogg., *Microcerotermes* sp., *Gonocephalum carpentariae*, Blackb., *Cirphis loreyi*, Dup., *Laphygma exempta*, Wlk., *Remigia frugalis*, F., *Melanitis leda*, L., *Metoponia rubriceps*, Macq., *Pseudoholophylla furfuracea*, Burm., *Lepidiota trichosterna*, Lea, *L. consobrina*, Gir., and *L. grata*, Blackb.

Several minor pests are also mentioned, but these are not considered to have any material effect on the tonnage of cane harvested.

COCK (S. A.). **Fumigation of Citrus Trees. Three Years' Operations.**—*J. Dept. Agric. Vict.*, xxv, pt. 8, pp. 493–496. Melbourne, August 1927.

A short account is given of the fumigation of citrus trees with hydrocyanic acid gas for the control of red scale [*Chrysomphalus aurantii*, Mask.] in Victoria during 1924–1927 [*cf.* *R.A.E.*, A, xv, 176].

Quarantine Proclamation, no. 176.—*Commonw. Australia Gaz.*, no. 125, reprint 1 p. Melbourne, 17th November 1927.

The importation into Australia of cotton seed or cotton lint is prohibited, except that cotton seed for planting may be imported at Brisbane only and by permission of the Minister for Health, and cotton seed, imported for crushing into oil and meal, must have originated in a country where the pink bollworm [*Platyedra gossypiella*, Saund.], or the Mexican boll-weevil [*Anthonomus grandis*, Boh.] are not known to exist. Raw cotton may be landed only at Sydney, Melbourne, Adelaide, Fremantle, Launceston, or any port, other than a Queensland one, approved by the Minister, and must be disinfected before being released from quarantine. This is a modification of the conditions of Quarantine Proclamation no. 149, which is repealed.

METZGER (F. J.). **Calcium Cyanide—"Powdered Hydrocyanic Acid."**—*Indust. Engin. Chem.*, xviii, no. 2, p. 161 (reprint, 7 pp.). Easton, Pa., February 1926.

The chemical reactions involved in the production of calcium cyanide from calcium carbide and liquid HCN are discussed, and the process of manufacture is described. The advantages of this material over liquid hydrocyanic acid are pointed out, particularly with regard to its greater safety in handling, transport and application. Furthermore, a satisfactory mortality of Coccids on *Citrus* can be ensured by the application of less total cyanogen than would be contained in the standard doses of liquid hydrocyanic acid, and no scorching of foliage occurs even when the leaves are thickly coated with the powder. The wider range of toxicity also renders possible the eradication of so-called resistant scales which survive the highest standard doses of liquid hydrocyanic acid.

Barss (H. P.) & Mote (D. C.). **Orchard Spray Program for Oregon.**—*19th Bienn. Rep. Oregon Bd. Hort.*, pp. 74–85. Portland, Ore., 1927.

Notes are given on the control of diseases and pests of fruit trees in Oregon, with spray programmes for orchards in the humid regions west of the Cascade Mountains and in the arid and irrigated regions east of them, with a modified form for use in home orchards. Spray materials and spray practices are discussed.

Atwell (H. C.). **The European Earwig** (*Forficula auricularia*, **Linn.**).—*19th Bienn. Rep. Oregon Bd. Hort.*, pp. 86–103, 5 figs. Portland, Ore., 1927.

Forficula auricularia, L. (European earwig) has been known in North America for nearly twenty years and has now spread to every considerable town in the Pacific Northwest, west of the Cascades, and into British Columbia, and has become a very serious pest. On several occasions cargoes from South America have been found to be heavily infested, and it is probable that it has been introduced from that country, where it is firmly established, as well as from Europe. The author maintains that as the earwig does not fly, its distribution must be directly due to human agencies. Its food habits, which are very varied, are discussed, and the observations of various authors are quoted [*R.A.E.*, A, viii, 432; xi, 429, etc.].

The duration of the life-cycle is greatly influenced by the temperature. Mating occurs during July, August and September, and on the approach of very cold weather the adults go into hibernation, although cold has no effect other than to render them sluggish. The female deposits 30–60 eggs about 2 inches below the surface of the soil or under boards or stones. These eggs may be found throughout the winter and early spring and hatch between the end of March and the beginning of May. About 2 weeks after hatching, the larvae come to the surface, accompanied by the females, which remain in the ground with them until then, nourishing them on grasses and other plants. By this time the hibernating males have also emerged, some being found under the bark of trees as early as February, and it supposed that a second mating takes place. The males are mostly dead by the middle of May, and the females by the end of July. During the first 2 or 3 weeks of May the females enter the ground to lay eggs for another brood, the larvae of which come to the surface during the latter part of June. In some seasons first and second instar larvae are found in August and September; these are in all probability the progeny of the first brood. The earwig has few natural enemies in the Pacific Northwest, the only ones of importance being garter snakes and owls.

Various European methods of trapping are discussed. The fact that earwigs hide in so many places during the day makes the use of sprays largely impracticable. Poison baits have been found to be the most adequate means of control, the one recommended consisting of 16 lb. wheat bran, 2 U.S. qts. molasses (as coarse as possible), 1 lb. sodium fluoride, and 2 U.S. gals. water, mixed as already described [*R.A.E.*, A, xi, 430]. This bait has only scorched plants when applied in a sloppy condition. It should be spread after sunset and kept dry for at least three days after application, as an excess of water will leach the sodium fluoride out of the bait. Baits should first be applied early in May against the hibernating females and the first brood, before the second batch of eggs is laid. A second application should be made a week or ten days later, and a third between 5th and 15th July. In a widespread infestation of contiguous areas the applications should be as nearly simultaneous as possible, and a great effort should be made to secure co-operation.

A brief account is given of the work with earwig parasites in Oregon [*R.A.E.*, A, xv, 396].

THOMPSON (B. G.). **The Aegeriidae or Clearwing Moths occurring in Oregon.**—*19th Bienn. Rep. Oregon. Bd. Hort.*, pp. 125–138, 5 figs., 3 refs. Portland, Ore., 1927.

The family AEGERIIDAE includes several important pests in Oregon, the larvae boring in roots or stems of trees or herbaceous plants. Brief descriptions of the adults, and in some cases of the immature stages, of each species are given.

Aegeria (*Synanthedon*) *rutilans*, Edw. (strawberry crown borer) caused serious damage to both young and old plantings of strawberries from 1924 to 1926, and in 1926 also did considerable damage to raspberries. Infested plants sometimes survive a wet season and produce a crop, but in a dry season they often die. The winter is passed in the larval stage ; during very cold or wet weather the larvae spin cocoons in which they remain inactive, but under favourable conditions they are active throughout the winter. Pupation begins late in March, and this stage may be found until the end of July, though the moths occur from April until early August. Infested plants should be dug up and burnt ; in irrigated districts the larvae can be effectively controlled by submergence.

A. (*S.*) *opalescens*, Edw. (peach and prune root borer) is a serious pest of peach and prune, and is injurious to cherries on *Prunus mahaleb* stock [*R.A.E.*, A, xiv, 655]. The life-history differs somewhat from that previously noticed [*R.A.E.*, A, ix, 163]. The eggs are laid on the trunk, branches or leaves, singly or in clusters, during July and early August and hatch in 3–4 weeks ; the larvae bore through the bark and work down to the crown of the tree, where they enter the cambium layer. The winter is passed in the larval stage in the tree, but in extremely wet soil the larvae may enter the ground and spin a silken cocoon in which they remain inactive until the soil becomes drier, when they again enter the tree and continue their boring. Pupation takes place in the soil, and most of the adults emerge during June and July, but pupae are found from May to September. The use of paradichlorobenzene, at the rate of $\frac{3}{4}$–1 oz. each for trees six or more years old and $\frac{1}{2}$ oz. for younger ones, is recommended for the control of this pest, and the method of applying it is described. Applications should be made from 15th August to 15th September. The life-history of *A.* (*S.*) *graefi*, Edw., which attacks wild cherry, prune, peach and apricot, is similar to that of *A. opalescens*, and it can be controlled in the same way.

A. (*S.*) *tipuliformis*, Cl., attacks both currants and gooseberries ; its life-history and control are briefly described [*cf. R.A.E.*, A, vii, 48]. *Pennisetia* (*Bembecia*) *marginata*, Harr. (loganberry crown borer) causes serious damage to blackberry, loganberry and raspberry [*R.A.E.*, A, ix, 166].

A. (*S.*) *novaroensis*, Edw. (Douglas fir pitch moth) attacks Douglas fir [*Pseudotsuga taxifolia*] and Engelmann spruce [*Picea engelmanni*]; the author believes that the life-cycle in western Oregon is much shorter than three years, the time given by Brunner [*R.A.E.*, A, iii, 670].

Vespamima sequoiae, Edw., infests *Sequoia* and various species of pine. The life-cycle is completed in two years; the adults mostly appear in August, and the larvae in September; pupation occurs about June of the second year, and the pupal stage lasts about two months [*cf.* *R.A.E.*, A, ii, 645].

The other species dealt with are of little or no economic importance. The larvae of *Trochilium* (*A.*) *tibiale*, Harr., in willow and poplar, *Paranthrene robiniae*, Edw., in willow, and *A.* (*S.*) *americana*, Beuten., in alder, bore in the trunk and larger branches. To protect trees against *T. tibiale*, the adults of which emerge in June and July, it is recommended that the trunk and larger branches should be kept covered, during May, June and July, with a wash consisting of 8 lb. quick lime, ½ lb. glue, 1 lb. naphthalene (flake) and sufficient water to make a thick paint. The quicklime should be slaked and allowed to cool, and the glue dissolved in hot water and added to it; when this is cool, the naphthalene should be sifted in and well stirred.

WILCOX (J.). **Observations on the Life History, Habits, and Control of the Narcissus Bulb Fly,** *Merodon equestris* **Fab., and the Lesser Bulb Fly,** *Eumerus strigatus* **Fallén, in Oregon.**—*19th Bienn. Rep. Oregon Bd. Hort.*, pp. 149–158, 10 figs. Portland, Ore., 1927.

In a survey made in May 1926 *Merodon equestris*, F. (greater bulb fly) and *Eumerus strigatus*, Fall. (lesser bulb fly) were found to be established in practically all the commercial plantings of *Narcissus* in Oregon; *E. strigatus* also attacks onion and hyacinth.

M. equestris has one generation a year. The eggs are laid singly in the soil at a depth of about ⅛ in., close to the plant, during the latter part of April and in May; only one egg is usually found to a plant. The details of oviposition are described. The larvae hatch in 6–15 days, the majority hatching in 8–10 days, and usually enter the bulbs through the basal plate, this being the only part not protected by several layers of hard, tough skin. They are full-grown by the autumn and pass the winter in the bulbs. Pupation takes place in the soil, usually at a depth of about half an inch, beginning early in March and continuing into April; the pupal stage lasts from 18 to 34 days, with an average of 30. In outdoor cages during 1926, when the spring was an early one, the first adult emerged on 27th March, and the last on 29th April. The stages are briefly described.

Bulbs attacked by *M. equestris* are worthless, having the centre hollowed out and the flower bud consumed; they usually rot, or are destroyed by *E. strigatus*, mites or fungi. The basal plate of an infested bulb is sunken and corky, and the entrance hole of the larva will be revealed on scraping it with a knife.

The second part of this paper, dealing with the life-history and control of *E. strigatus*, is almost identical with one previously noticed [*R.A.E.*, A, xiv, 654]. The control measures apply also to *Merodon equestris*, against which 100 per cent. control was obtained with mercury bichloride as an ovicide; *M. equestris* was, however, much less numerous than *E. strigatus* in the test plots.

ILLINGWORTH (J. F.). **Predominance of** *Pheidole megacephala* **(Fab.). (Hymenoptera.)**—*Proc. Hawaii. Ent. Soc. 1926*, vi, no. 3, pp. 389–390. Honolulu, October 1927.

Pheidole megacephala, F., is an ant that has exterminated many noxious insects in Honolulu, and it will even attack species larger than itself. Its method of attacking *Solenopsis geminata*, F. (fire ant) is described. A colony of the latter had been placed for experimental purposes in a root cage with growing pineapple plants, which had not been isolated from the ground. By the next morning the whole colony had been destroyed by an invasion of *P. megacephala*.

SWEZEY (O. H.). **The Sisal Borer in Hawaii.**—*Proc. Hawaii. Ent. Soc. 1926*, vi, no. 3, pp. 403–404, 3 refs. Honolulu, October 1927.

The Curculionid, *Scyphophorus acupunctatus*, Gyll. (Mexican sisal borer) is recorded from Hawaii as responsible for decay of the base of the leaves of *Agave mexicana*.

SWEZEY (O. H.). *Hyposoter exiguae* **(Viereck) in Hawaii. (Hymenoptera.)**—*Proc. Hawaii. Ent. Soc. 1926*, vi, no. 3, pp. 404–407. Honolulu, October 1927.

The Ichneumonid, *Hyposoter exiguae*, Vier., a valuable army-worm parasite, is well established in Hawaii. The species recorded as hosts in Hawaii are *Cirphis unipuncta*, Haw., *Spodoptera mauritia*, Boisd., *S. exigua*, Hb., *Phytometra* (*Plusia*) *chalcytes*, Esp., *Nesamiptis obsoleta*, Butl., and *Scotorythra paratactis*, Meyr. The last is closely allied to *S. paludicola*, Butl., which recently defoliated the forest of koa [*Acacia koa*] at Olinda, Maui, and as the parasite is now established in that region, it is hoped that a similar outbreak will be prevented in the future.

SWEZEY (O. H.). **Notes on** *Rhyncogonus extraneus* **(Col.).**—*Proc. Hawaii. Ent. Soc. 1926*, vi, no. 3, pp. 407–409. Honolulu, October 1927.

The weevil, *Rhyncogonus extraneus*, Perkins, which was taken in a sugar-cane field at Oahu in 1904, has since increased and was quite abundant on the leaves of young sugar-cane in the same locality in November 1922. At this time the larvae were numerous in the soil, some feeding on decaying sugar-cane seed cuttings in the ground. The sugar-cane leaves were not eaten. In captivity the eggs are laid in clusters of 2–12, placed side by side in a fold of the leaf. They hatch in about 8 days, and the larval stage lasts 3–4 months.

In confinement the adults readily ate *Portulaca* and other plants but would not touch sugar-cane. The larvae were found to eat into pieces of sugar-cane at cut surfaces and to eat fresh cane roots.

CURRAN (C. H.). **A new Tachinid Parasitic on Armyworms in Mexico.**—*Proc. Hawaii. Ent. Soc. 1926*, vi, no. 3, pp. 497–498. Honolulu, October 1927.

Archytas cirphis, sp. n., has been reared from pupae of *Cirphis* spp. occurring in sugar-cane fields in Mexico. Most of the armyworms present were *Cirphis latiuscula*, H.-S., though *C. cholica*, Dyar, and probably other species also occurred.

A. piliventris, Wulp, has been reared from pupae of cutworms, probably *Laphygma frugiperda*, S. & A., and *Agrotis ypsilon*, Rott., collected in lucerne fields in Mexico.

SWEZEY (O. H.). **Notes on the Mexican Tachinid,** *Archytas cirphis* **Curran, introduced into Hawaii as an Armyworm Parasite (Diptera).**—*Proc. Hawaii. Ent. Soc. 1926*, vi, no. 3, pp. 499–503. Honolulu, October 1927.

A list is given of the places on Oahu from which *Archytas cirphis*, Curr., has been recovered during the years 1925–1927. Its distribution to other islands and the method of attacking the host are briefly described [*R.A.E.*, A, xv, 321]. The life-cycle from the time the host is attacked to the emergence of the adult occupies 28–31 days. Apparently, it is possible for a new brood to occur each month throughout the year. A list of the introduced parasites of army worms in Hawaii, comprising eight species, is appended.

WILLARD (H. F.). **Presidential Address.—Some Observations in Hawaii on the Ecology of the Mediterranean Fruit Fly** *Ceratitis capitata* **Wiedemann and its Parasites.**—*Proc. Hawaii. Ent. Soc. 1926*, vi, no. 3, pp. 505–515. Honolulu, October 1927.

An account is given of the effect of environment on *Ceratitis capitata*, Wied., since its introduction into Hawaii in about 1910. The numerous food-plants in Hawaii supply this fruit-fly with constant food and enable it to be abundant at all times. Some fruits are less favourable for its development than others, the most important of the former being *Citrus* [*R.A.E.*, A, iii, 332]. Grapes are seldom attacked; the examination of 2,251 eggs on them showed that 86 per cent. had failed to hatch, probably owing to a lack of oxygen in an unfavourable medium. The medium in which the larva lives has also an important bearing on the ability of its parasites to attack it, and the number infesting coffee berries shows a decrease of over 97 per cent. since 1917 as a result of attack by *Opius humilis*, Silv., *Diachasma tryoni*, Cam., and *D. fullawayi*, Silv., indicating the effect on the larvae in a medium where they are highly subject to parasitism. The medium in which the parasite larva lives also has a great influence on its form and rate of development. In the case of the above mentioned three parasites, the first stage of the larva is equipped with a heavily chitinised head and strong sharp mandibles enabling it to separate its food (which consists solely of fatty tissue) from the internal structures of the host, and to defend itself in the case of superparasitism. When the host larva leaves the fruit to pupate, the danger of superparasitism is passed, and histolysis changes the food of the parasite from a semi-solid to a liquid condition. As the mandibles are no longer required, they are cast with the first moult; this however, never occurs until the host attempts to pupate.

Comparatively little is known about the cause of the inability of parasites of a particular insect to reproduce in others of the same group. Thus the parasites here discussed are unable to develop in *Dacus* (*Bactrocera*) *cucurbitae*, Coq.; though oviposition may occur, the eggs become encysted in a mass of transparent cellular material and killed. The eggs of *Tetrastichus giffardianus*, Silv., were encysted in a similar manner, but when *D. cucurbitae* is first parasitised by *O. fletcheri*, Silv., and then by *T. giffardianus* some of the latter always develop. No instance was observed in which one of the parasites of *C. capitata* was able to develop in *D. cucurbitae*, though the host had been previously parasitised by *O. fletcheri*.

The effect of cold storage on *C. capitata* is also influenced by environment; thus in Hawaii one mature larva survived for 18 days in packed fruit at a temperature of 32–33° F., but none survived longer, whereas in Africa, under similar conditions, 33 larvae out of 49 survived for six weeks at a mean temperature of 33·972° F. It seems reasonable to conclude that the more changeable climate of South Africa has produced a race of flies that is more resistant to temperature changes than those in the coastal regions of Hawaii where very little variation occurs throughout the year.

Timberlake (P. H.). **Biological Control of Insect Pests in the Hawaiian Islands.**—*Proc. Hawaii. Ent. Soc. 1926*, vi, no. 3, pp. 529–556, 5 pls., 6 figs. Honolulu, October 1927.

The history of the introduction of beneficial insects into Hawaii for the destruction of insect pests and noxious plants and the pollination of trees such as figs is reviewed. The main reason for the success obtained in Hawaii lies in the fact that the insect fauna of the Islands is extremely simple in comparison with that of the temperate zone of the mainland and still more so in comparison with continental tropical faunas.

The introduced parasites are generally free from all secondary enemies and soon increase to their maximum efficiency.

Hutson (J. C.). **The Cotton Leaf-caterpillar,** *Cosmophila erosa*.—*Trop. Agriculturist*, lxix, no. 3, pp. 166–167, 1 pl.; also *Leafl. Dept. Agric. Ceylon*, no. 47, 1 p., 1 pl. Peradeniya, September 1927.

The bulk of the information given in this paper has been previously noticed [*R.A.E.*, A, xi, 353; xii, 110]. The eggs of *Cosmophila erosa*, Hb. (cotton leaf-caterpillar) are laid singly on the leaves and young shoots of cotton plants and hatch in about 4 days; the larval stage lasts about 3–4 weeks; pupation then takes place, and the adults emerge in about 10 days. Oviposition occurs within a week of emergence, and one individual may lay over 800 eggs. Under favourable conditions the females live about 2–4 weeks, and the males about 3–4 weeks. Clean cultivation should be practised, and such crops as ladies' finger and roselle [*Hibiscus* spp.] should not be grown near the cotton area. On several occasions the moth has been known to disappear entirely after heavy rains.

Theobald (F. V.). **The Plant Lice or Aphididae of Great Britain. Vol. ii.**—Demy 8vo, vi+411 pp., 182 figs. London and Ashford, Kent, Headley Bros., 1927. Price 30*s*.

The present volume of this series, of which the first has been noticed [*R.A.E.*, A, xiv, 342], completes the study of the tribe Aphidini and deals in part with the tribe Callipterini. Descriptions of five new species are included.

Carpenter (G. H.). **The Biology of Insects.** –Demy 8vo, xv+473 pp., 16 pls., 88 figs., 16 pp. refs. London, Sidgwick & Jackson Ltd., 1928. Price 16*s*.

Insect biology is discussed in its various aspects ; structural features of insects are described only in so far as is necessary for the understanding of function and behaviour, while questions of systematic entomology are touched upon only as they bear upon problems of ecology and evolution. The bionomic relations of insects with other organisms including plants, animals and other insects are discussed, with a short account of the parasitic enemies of insect life. The last chapter deals with insects in their relations to mankind, both as enemies and allies of the cultivator, as household pests, destroyers of buildings and furniture, as disease carriers, as producers of material used for food or industrial purposes, etc.

Trouvelot (B.) & Willaume (F.). **Manuel-guide des traitements insecticides et fongicides des arbres fruitiers.**—8vo, 179 pp., 13 pls., 51 figs. Paris, Paul Lechevalier, 2nd edn., 1927. Price *Fr.* 16.

This revised edition of this handbook explains the principal causes of failure in insecticidal treatments, the formulae and method of preparation of the chief materials used, describes suitable apparatus and gives notes on the most important pests of fruit-trees in France and on the best times and methods of application of insecticides. The cost of the various measures is also discussed.

Marchal (P.). **Travaux des Stations d'Entomologie agricole et de Zoologie appliquée de l'Institut des Recherches agronomiques.**—*C.R. Acad. Agric. Fr.*, xiii, no. 27, pp. 868–882. Paris, 1927.

An account is given of the origin of the entomological stations established under the Institut des Recherches agronomiques and of the local stations connected with them, and the work accomplished at these stations during 1926 is reviewed.

Jaubert (G. F.). **Destruction de la fausse teigne** (*Galleria mellonella*) **au moyen de la chloropicrine.**—*C.R. Acad. Sci. Fr.*, clxxxv, no. 26, pp. 1608–1610, 2 refs. Paris, 1927.

While chloropicrin will readily destroy adults and larvae of *Galleria mellonella*, the addition of carbon tetrachloride, 1 part by volume chloropicrin to 9 parts tetrachloride, is necessary to kill the eggs, the tetrachloride possibly acting as a fat solvent. When 100 frames from beehives piled in a hermetically sealed box were treated with 0·5 gr. chloropicrin, diluted with tetrachloride, per kilogram weight of the frames, entirely satisfactory results were obtained. This method of disinfection is simple, and the mixture is said not to be inflammable. Commenting upon this paper G. Bertrand stated that chloropicrin is itself a fat solvent, and that he had destroyed eggs of such insects as bugs, lice, fleas, etc., by means of its fumes alone.

Cleare, Jr. (L. D.). **The Rice Moth-borer** (*Diatraea saccharalis*, **F.**) **and Recommendations for its Control.**—*J. Bd. Agric. Br. Guiana*, xx, no. 3, pp. 198–199. Georgetown, July 1927.

Diatraea saccharalis, F. (sugar-cane moth borer) has become increasingly injurious to rice in British Guiana during recent years, and unless remedial measures are undertaken, the losses may seriously affect the production of rice in the colony. The eggs are laid on the leaves of the plant, and the emerging caterpillars bore into the stalks, causing them to break off and fall to the ground before flowering, or, if flowers are already formed, to fail to produce grain. In districts where two crops of rice are grown annually and which have an adequate and dependable water supply, the stalks should be cut within a few inches of the ground when the crop is harvested, and the field immediately flooded so that the remaining stubble is submerged. Where only one rice crop is grown, if the old stools do not die quickly, they should be ploughed up. The fields, if left fallow after reaping, should be ploughed again at least two weeks before planting to remove and bury all heavy grasses and self-sown rice, and then completely submerged. The planting of a suitable rotation crop, preferably a pulse such as *Phaseolus mungo* or *Vigna sinensis*, between two rice crops is also recommended. Burning the rice straw after separation of the grain is not advisable, though it is at present practised in most parts of the colony ; in time, this procedure seriously affects the yield of the crop.

[Cleare, Jr. (L. D.).]. **" Cockles " in the North-western District.**—*J. Bd. Agric. Br. Guiana*, xx, no. 3, p. 200. Georgetown, July 1927.

The beetle, *Ligyrus ebenus*, DeG., which at times causes injury to sugar-cane on the coast lands, has recently been reported in numbers from farms in the north-west of British Guiana, where it attacks chiefly tannias [*Xanthosoma*], the yellow varieties being more susceptible than white ones. The larval stage is also injurious.

LePelley (R. [H.]). **Studies on the Resistance of Apple to the Woolly Aphis** (*Eriosoma lanigerum* **Hausm.**).—*J. Pom. Hort. Sci.*, vi, no. 3, pp. 209–241, 1 pl., 21 refs. London, September 1927.

Investigations into the resistance of apple trees to *Eriosoma lanigerum*, Hausm. (woolly aphis) were made [*cf. R.A.E.*, A, xi, 537 ; xiii, 15] with the object of testing the resistance of commercial root-stocks and of scion varieties and the interaction of scion and stock. Tests were also carried out to discover if the character of immunity could be transmitted by experimenting with new seedlings which had Northern Spy for one parent.

The following is largely taken from the author's summary. The technique used for artificial infestation of apple with *E. lanigerum* is described ; the method which proved to be most successful was that of placing small pieces of twig infested with the pest into calico bags used to protect stocks. The insects then left the twigs and infested these stocks. The question of resistance is discussed, and the methods used in the attempt to determine the degrees of resistance of various root-stocks are described and examined. Northern Spy was heavily infested, and a description of the results obtained is given. This species was used as a control, especially when examining highly resistant plants. It was found that it is more resistant to attack than any of the 18 other commercial root-stocks tested. The preliminary results obtained from the artificial infestation of 15 commercial scion varieties showed that none was immune from attack or highly resistant to it. Four varieties previously reported as immune were also tested. First infestations on maiden trees, made to test whether there is interaction between stock and scion with respect to woolly aphis resistance, showed no definite results in support of this belief. The tests of seedlings derived from crossing Northern Spy with susceptible varieties, showed that the factor or factors that determine immunity are inherited. They also indicated that Northern Spy is heterozygous in respect of this character. A short account is given of the troubles caused during these experiments by certain apple pests and of the means by which they were controlled.

Gillette (C. P.). **Notes on a few Aphid Species and the Genus** *Illinoia*, **Wilson.**—*Ann. Ent. Soc. Amer.*, xx, no. 3, pp. 344–348, 2 figs. Columbus, Ohio, September 1927.

The author does not consider that the genus *Illinoia* should be retained as distinct from *Macrosiphum*, and in any case he is of the opinion that *pisi*, Kalt., should belong to that genus and not to *Illinoia*.

Vance (A. M.). U.S. Bur. Ent. **On the Biology of some Ichneumonids of the Genus** *Paniscus*, **Schrk.**—*Ann. Ent. Soc. Amer.*, xx, no. 3, pp. 405–416, 1 pl., 1 fig., 11 refs. Columbus, Ohio, September 1927.

The observations recorded on the Ichneumonids, *Paniscus spinipes*, Cushm., and *P. geminatus*, Say, var. *sayi*, Cushm., were made in Virginia in the late summer and autumn of 1924, when about 5 per cent. of the larvae of the corn earworm, *Heliothis obsoleta*, F., in certain localities were attacked by these parasites. The conditions of rearing in the laboratory are explained, and a typical oviposition observation is recorded. Females of both species readily oviposited upon larvae of *H. obsoleta* in glass cages, the host larva being stung in each case before oviposition occurred. From 1 to 5 eggs may be deposited upon one host larva, but apparently never more than one parasite larva survives. Both species paralyse their host by the injection of some toxic substance before ovipositing. Many larvae are attacked in turn ; one female deposited 95 eggs upon 78 mature larvae. Cutworms or army worms placed in the cages were chosen in preference for oviposition. The egg and the method of its attachment are described. The entire larval period of these parasites is spent on, and at the expense of, the host. Almost immediately upon hatching, the mouthparts become fastened to the host body, and in this position the parasite larva feeds and grows. During the earlier larval stages of the parasite, the host remains alive in a mature or pre-pupal condition. When the parasite larva reaches maturity, it spins itself a cocoon in which it pupates, but can only do so in a space just large enough to allow of free movement. Both these species of *Paniscus* reproduce parthenogenetically.

Glaser (R. W.). **Studies on the Polyhedral Diseases of Insects due to Filterable Viruses.**—*Ann. Ent. Soc. Amer.*, xx, no. 3, pp. 319–342, 1 pl., 18 refs. Columbus, Ohio, September 1927.

The following is taken largely from the author's summary. Polyhedral diseases are widespread among Lepidopterous larvae and are an important factor in the control of many of the most injurious pests. Twenty-two species, among which, unfortunately, is the silkworm, *Bombyx mori*, L., have been recorded as susceptible to infection. The present study deals primarily with two forms of polyhedral disease, namely, grasserie of the silkworm and wilt of the tent caterpillar, *Malacosoma americana*, F. Infection in both diseases occurs naturally through the mouth by feeding but can be experimentally produced by inoculation. The period from infection to death varies from 4 to 24 days with an average of 10 days, this variation probably depending upon the natural resistance of the host, the concentration of the virus, and temperature. The polyhedral bodies found in the larvae of *M. americana* and of *B. mori* differ in size and shape, and similar differences exist within an individual host. These bodies when freed from the virus by washing and centrifuging are incapable of producing disease by injection into larvae, and no evidence was obtained indicating that these structures are living entities or envelop living material. They originate within the nuclei of the hypodermal fat, tracheal matrix and certain blood cells. The blood is a useful diagnostic index and can be used in following the progress of the disease. It seems necessary, from the evidence obtained, to regard the polyhedra as reaction bodies arising in certain tissues as by-products of nuclear changes produced by the virus. Experiments are presented to show that grasserie of the silkworm and wilt of the tent caterpillar and of the gipsy moth [*Porthetria dispar*, L.], so similar histopathologically, are caused by distinct viruses which are absolutely specific. It is shown that some larvae are immune from their specific virus. It has so far been impossible to detect polyhedral disease within moths or eggs, but an experimental result is presented which seems to demonstrate that the virus in the case of *M. americana* is transmitted from generation to generation through the egg.

Böning (K.). **Die kalifornische Blattrollkrankheit der Rübe (curly top). Sammelreferat der wichtigsten nordamerikanischen Arbeiten.** [The Californian Curly Top Disease of Beet. A collective Résumé of the most important American Papers.]—*Centralbl. Bakt.*, IIte Abt., lxxii, no. 15–24, pp. 379–398, numerous refs. Jena, 30th November 1927.

This paper comprises a survey of the position of the beet leafhopper, *Eutettix tenella*, Baker, as a vector of curly-top [*R.A.E.*, A, xiv, 450, etc.]

Hecht (O.). **Blausäuredurchgasungen zur Schädlingsbekämpfung.** [Fumigation with Hydrocyanic Acid Gas in the Control of Pests.] —*Naturwissenschaften*, xvi, no. 2, pp. 17–23, 11 refs. Berlin, 13th January 1928.

This is a summary of the use of hydrocyanic acid gas as a fumigant in the destruction of insect and other pests.

Begemann (H.). **Takkenboeboek van de koffie** (*Xyleborus morigerus*, **Blandf.**). [The Coffee Twig Borer, *X. morigerus*.]—*Bergcultures*, ii, 17th September 1927, p. 329 (reprint, 4 pp., 4 pls.). [Batavia, 1927.]

A brief description is given of all stages of *Xyleborus morigerus*, Blandf., the commonest twig-borer of coffee in Java. The female bores a hole about 1 mm. in diameter, usually on the underside of the twig, down to the pith which is removed to form a chamber in which the eggs are deposited in irregular heaps. The average number of eggs is 60. There are about 20 females to 1 male. The males are wingless, and mating occurs before the young females emerge from the twig. The damage done may be considerable. In 1926 one coffee estate had a crop-loss estimated at about £4,000. Both larvae and adults are ambrosia feeders. Two parasitic Hymenoptera have been seen. One, a Chalcidid, is fairly common, and in breeding chambers where it occurs all the larvae except the small ones are parasitised. The proportion of females to males is as 2 to 1. A less common parasite resembles in appearance and habits the Bethylid imported from Uganda [*Prorops nasuta*, Wtst.] against the coffee berry borer [*Stephanoderes hampei*, Ferr.]. It oviposits in the larvae and pupae of *X. morigerus*. Incubation lasts 17–24 days, a little less than with *P. nasuta*. It does not parasitise *S. hampei*. In mines where this parasite is found, few larvae of *X. morigerus* occur, only the adults being usually present. It would thus seem that, as with *P. nasuta*, the adult parasite also lives on the host. Apparently *X. morigerus* can breed in certain plants such as lamtoro [*Leucaena glauca*], where it suffers little from parasites. Details are given of the occurrence of the various stages of *X. morigerus* and of its parasites in lamtoro and coffee throughout the year. October is the best month for the removal of dead or dying twigs.

To check this pest, the bushes in young plantations must be rendered as vigorous as possible before they begin bearing berries. Artificial measures must be applied at the time of year when the parasites are absent, or present in small numbers only.

Alinder (S.). **Eine coccinellidenfressende Rhynchote.** [A Rhynchotan Devourer of Coccinellids.]—*Mitt. Münch. ent. Ges.*, xvii, no. 7–12, pp. 75–76. Munich, 1st November 1927.

The Reduviid bug, *Sphydrinus venans*, Stål, is recorded as preying on Coccinellids in Kenya.

[Il’inskiĭ (A. M.).] **Ильинский (А. М.).** *Polychrosis botrana*, **Schiff.** [*In Russian.*]—*Comm. Inst. Astrachan. Def. Plant.*, i, fasc. 5–6, pp. 3–16, 1 pl. Astrakhan, 1927. (With a Summary in French.)

A detailed account is given of the morphology of all stages of *Polychrosis botrana*, Schiff., which is one of the common pests of grape-vines in Astrakhan.

[Il'inskiĭ (A. M.).] **Ильинский (Ал. М.). The Chief Pests of Agricultural Plants in the Astrakhan Government in 1924.**

[Vodolagin (V. D.).] **Водолагин (В. Д.). Review of Pests of Plants in the Astrakhan Government in 1925.** [*In Russian.*]—*Comm. Inst. Astrachan. Def. Plant.*, i, fasc. 5–6, pp. 17–28, 29–36. Astrakhan, 1927. (With Summaries in French.)

Lists are given of the insect pests recorded in Astrakhan during 1924 and 1925, with notes on their seasonal occurrence, food-plants and economic importance.

[Arustamov (D.).] **Арустамов (Д.). A few Words on the Vine Pests of the Gandzhinsk Region.** [*In Russian.*]—*Vyest. Vinodyel.*, xxviii, no. 9, p. 547. Odessa, September 1927.

Pseudococcus citri, Risso, is becoming more abundant in the vineyards of this region of Transcaucasia, causing losses of as much as 30–40 per cent. of the fruit. The development of the grapes is impeded by the secretions of the mealybug, and it will probably be a very serious pest in 1928, unless winter measures against the eggs prove successful. Various sprays, such as soap, tobacco or oil emulsion, have been tried, without success.

[Khlebnikova (M. I.).] **Хлебникова (М. И.). Bionomics of *Eurydema oleracea*, L., in Western Siberia.** [*In Russian.*]—*Trans. Tomsk St. Univ.*, lxxvii (1926), no. 3, pp. 200–208, 1 pl., 9 refs. Tomsk, 1927.

Eurydema oleraceum, L., has attracted attention in the Tomsk province since 1921, owing to the damage done by it to cultivated cruciferous plants. This bug hibernates in the adult stage, but after hibernation the adults only become mature sexually after about a month of supplementary feeding. This occurs mainly on young cultivated crucifers, which suffer seriously. Several wild Cruciferae, as well as some plants of other families, on which the bugs occur in nature, may also serve as food-plants. The oviposition period extends from early June to early August and is closely dependent on high temperatures. The maximum number of eggs laid by one female may be 60. Though the bugs, when pairing is in progress, collect in restricted areas, the eggs are scattered widely and laid on a variety of plants. They are always in groups of 12, placed in two parallel rows. The larvae undergo five moults before becoming adult; this happens in August, there being thus only one generation a year. The autumn adults differ from those that have hibernated by being paler in colour [*cf.* *R.A.E.*, A, xv, 159]. If the insects are kept in the laboratory, this change of colouration occurs as early as December. For hibernation the bugs usually select woods of birch mixed with pines, where they hide under fallen leaves, but this is not the only place for hibernation. The winter quarters may be at some distance from the breeding-places, the bugs being good flyers. The eggs are parasitised by a Chalcid, and the adults are subject to attacks by the fly, *Clytiomyia continua*, Pz. The eggs of this parasite are laid under the wings of the host between the segments, probably when the bug is about to fly. It is not known how many generations a year the fly has, but the larvae that enter their host in autumn hibernate in it.

[RIMSKIĬ-KORSAKOV (M. N.).] **Римский-Корсаков (М. Н.). Injuries to Trees and Bushes by Insects.** [*In Russian.*]—Cr. 8vo, 127 pp., 79 figs. Moscow & Leningrad, Govt. Publ., 1927. Price 80*k.*

This booklet is in the form of a key arranged under the plants and is intended for the identification of insect pests according to the injury they cause.

KROGERUS (R.). **Beobachtungen über die Succession einiger Insektenbiocoenosen in Fichtenstümpfen.** [Observations on the Succession of Insect Communities in Spruce Stumps.]—*Notul. ent.*, vii, no. 4, pp. 121–126. Helsingfors, 28th December 1927.

This is a record of the various insects found in stumps of spruce in Finland, one, two and three summers after felling.

DIEUZEIDE (R.). **Le puceron lanigère du pommier** (*Eriosoma* [*Schizoneura*] *lanigerum* **Hausmann).**—*Rev. Zool. agric.*, xxvi, nos. 6 & 7, pp. 81–92 & 97–110, 2 pls., 6 figs., 4 pp. refs. Bordeaux, June & July 1927.

This is a detailed account of the biology of *Eriosoma lanigerum*, Hausm. (woolly aphis) compiled from existing European and American literature.

AGHION (E.). **Note sur le moyen de combattre le ver du coton par l'arséniate de chaux.**—*Bull. Un. Agric. Egypte*, xxv, no. 183, pp. 135–143, 3 figs. Cairo, August–September 1927.

The injury caused to cotton by *Prodenia litura*, F. (*littoralis*, Boisd.) in Egypt results in general weakening of the plants and retarding of boll formation, thus exposing the bolls to attack by other pests. Hitherto hand collection has been the only method employed against it. In experiments with calcium arsenate, the dust was applied both in fields where larval injury was already noticeable and in those where the larvae had not yet hatched. The applications were made in the morning so that the calcium arsenate would adhere to the leaves owing to the presence of dew ; two applications were made at intervals of 15 to 20 days, using about 25 lb. to the acre. About a fortnight after the second treatment, practically no damage was noticed, the plants were healthy and about 8–10 ins. taller than those on the untreated plots. The latter showed considerable injury in spite of hand collections.

BLANCHARD (E. E.). **Two new Egg-parasites from Argentina.**—*Physis*, viii, no. 31, pp. 598–602, 2 figs. Buenos Aires, 15th November 1927.

Hadronotus molinai, sp. n., was reared from the eggs of *Anasa guttifera*, Berg., a pest of cucurbits, over which it exercises a considerable degree of control.

ZIRNITS (J.). **Beiträge zur Kenntnis der Aphiden Lettlands.** [Contributions to the Knowledge of the Aphids of Latvia.]—*Z. wiss. InsektBiol.*, xxii, nos. 6–8, 9, pp. 204–210, 244–256, 6 refs. Berlin, 31st August, 1st November 1927.

This list records 103 species from northern Latvia, with the season of occurrence and the food-plant in each case.

CAFFREY (D. J.) & WORTHLEY (L. H.). **The European Corn Borer: Its Present Status and Methods of Control.**—*Fmrs'. Bull. U.S. Dept. Agric.*, no. 1548, 47 pp., 42 figs. Washington, D.C., October 1927.

In this bulletin, which supersedes an earlier one [*R.A.E.*, A, xii, 179] the usual recommendations for controlling *Pyrausta nubilalis*, Hb. (European corn borer) are given [*R.A.E.*, A, xv, 451, 502, etc.], and machines suitable for burning over the fields are described. Disking maize stalks or high-cut stubble in infested fields is objectionable, as it leaves abundant shelter for the borers. Maize planted after 10th June generally escapes severe damage by the borer, and where the pest is present in numbers, such late planting might be adopted with advantage. Trap crops are not considered reliable as a method of control, and insecticides, trap lights, baits and the use of infested fields for pasture are all considered to be ineffective. Insect parasites may eventually help in reducing the numbers, but no appreciable results can be expected from them for several years.

HERBERT (F. B.). **Rapid Spraying versus Dusting in Thrips Control.**—*J. Econ. Ent.*, xx, no. 5, pp. 665–667. Geneva, N.Y., October 1927.

These experiments, undertaken against *Taeniothrips inconsequens*, Uzel (pear thrips) on prunes in California showed that a liquid spray can be applied almost as rapidly as a dust. The equipment is described. The spray consisted of 1½ gals. distillate emulsion and ¾ pt. 40 per cent. nicotine sulphate to 100 gals. water, at the rate of 2 gals. to each tree. The dust (8 per cent. Nicodust) was applied at the rate of 50 lb. to the acre, which is somewhat higher than the normal amount of 30 lb., but even at the reduced rate, the cost is practically double that of the liquid spray, which was more effective. The cost of labour for spraying is somewhat higher than for dusting, but this is more than counteracted by the lower cost of the materials. Both materials killed the insects, but the fumes from the spray lasted twice as long as those from the dust; the liquid also penetrates into the crevices of the buds better and is less dependent on weather conditions.

QUAYLE (H. J.). **Spray and Fumigation Combination for Resistant Red Scale.**—*J. Econ. Ent.*, xx, no. 5, pp. 667–673. Geneva, N.Y., October 1927.

Fumigation with hydrocyanic acid gas has been considered a satisfactory method of controlling red scale [*Chrysomphalus aurantii*, Mask.] on *Citrus* until recent years when in certain localities of California this scale has become more or less resistant to the gas [*R.A.E.* A, xi, 80]. Oil sprays on the other hand may kill 90 per cent. of the scales on the fruit, but a very much lower number on the wood. It has been found that though the spray kills best on the fruit, fumigation produces the best results on the branches ; consequently, a combination of the two has been tried. Where fumigation was followed by spraying, 97·7 per cent. of the scales were killed, but where the trees were fumigated after spraying with oil, 99·4 per cent. were killed. In spraying it is easier to cover the fruit on the outside than on the inside of the tree, while in fumigation the scales on the outside of the tree are more likely to escape owing to the lower concentration of the gas near the tent. The oil is a wax solvent and tends to dissolve the waxy covering and in some cases loosen the scale, thus making it possible for the gas to reach the insect more readily. When the oil is applied before fumigation, it also protects the tree and enables a higher dosage to be applied without risk of injury.

CAMPBELL (R. E.). **Is there a Need of increased Knowledge of Entomology ?**—*J. Econ. Ent.*, xx, no. 5, p. 673. Geneva, N.Y., October 1927.

Only the following abstract of this paper is published : The general public, especially in these times of urban trends, has not a sufficient knowledge of nature. The study of insects should form an important and interesting part of nature study. The increasing importance of insects as man's chief competitors makes it practically necessary that there should be a more general knowledge of them. In the study of insects, and methods of combating them, highly trained specialists are needed, and to provide these a greater interest in entomology must be aroused.

JACOBSEN (W. C.). **The Relation of the Public's Knowledge of Insects and their Destructiveness to Quarantine Enforcement.**—*J. Econ. Ent.*, xx, no. 5, pp. 674–678. Geneva, N.Y., October 1927.

While a great proportion of the public have a certain knowledge of insects and their depredations, and are therefore in favour of plant quarantine enforcement, a large number are very apathetic to such measures, mainly because of their ignorance. The value of popular, yet brief and accurate, press items and simple teaching of the subject in elementary schools, etc., in this connection, is pointed out.

CAIN (B. C.). **Interesting Boy Scouts in Entomology.**—*J. Econ. Ent.*, xx, no. 5, pp. 679–681. Geneva, N.Y., October 1927.

The methods by which boy scouts are interested in entomology and the value of the work are briefly discussed.

FLEMING (W. E.). U.S. Bur. Ent. **Fluosilicates as Insecticides for Japanese Beetle.**—*J. Econ. Ent.*, xx, no. 5, pp. 685–691, 7 refs. Geneva, N.Y., October 1927.

The fluosilicates are crystalline compounds more soluble in water than is acid lead arsenate. The approximate amounts that dissolve in 1,000 parts of water at room temperature are in the case of barium, potassium and sodium fluosilicate, 0·34 parts, 0·94 parts and 7·14 parts respectively, as compared with 0·16 parts in the case of acid lead arsenate. When fluosilicates are dusted on foliage, the particles do not settle readily on the leaves, and a large majority of those that do adhere are easily washed off by rain. The fluosilicates in general are not compatible with Bordeaux mixture, lime-sulphur solution or soap solutions.

The toxicity of barium, potassium and sodium fluosilicates to *Popillia japonica*, Newm., appears to be of the same order as that of acid lead arsenate, and they do not injure apple, peach and bean foliage to any extent, but other fluosilicates cause severe damage. All fluosilicates injure smartweed foliage, and owing to the sensitiveness of this plant it was used in experiments with various spreaders. The damage to the foliage is due to some extent to an excess of soluble fluosilicate coming in contact with the leaf.

A series of mixtures of lime and fluosilicate containing from 10 to 90 per cent. lime were dusted and sprayed on the foliage. The injury decreased as the proportion of lime in the mixture was increased. Barium and potassium fluosilicate caused no injury with the higher proportions of lime, but the calcium and sodium salts even in the highest dilutions affect the foliage of smartweed. The addition of lime made the foliage more palatable, but at the same time decreased the killing power ; this is due to the conversion by the lime of a part of the fluosilicate into the less toxic fluoride.

Particles of the fluosilicates were also coated with lead oleate in strengths varying from 1 to 5 per cent. These coated fluosilicates do not make good sprays as they do not mix readily with water, but when dusted on the foliage they adhere much better than the untreated particles. The lead oleate does not protect the foliage and does not affect the toxicity of sodium and potassium fluosilicate, though it appears to increase the toxicity of the barium and calcium salts. This apparent increase in toxicity may be due to the fact that the lead oleate is not changed into a soluble oleate in these cases and tends to increase the adhesion of the fluosilicate particles to the leaf surface. Barium fluosilicate coated with 2 per cent. lead oleate, which gave the best results, has 125 per cent. the efficiency of acid lead arsenate in killing the beetles.

It is therefore concluded that barium, potassium and sodium fluosilicates may be substituted for acid lead arsenate in the control of *Popillia japonica*, but further work is necessary in order to prevent their injurious action on plants and to improve their adhesive properties.

SNAPP (O. I.). U.S. Bur. Ent. **The Status of the Oriental Peach Moth in the South.**—*J. Econ. Ent.*, xx, no. 5, pp. 691–695. Geneva, N.Y., October 1927.

Cydia (*Laspeyresia*) *molesta*, Busck (oriental peach moth) was first found in the South in the autumn of 1923. Since then it has been recorded from various localities in the Southern States. Under insectary conditions in Georgia six generations and a partial seventh were obtained in 1925, and five and a partial sixth in 1926. Under natural conditions in Georgia the moth has not been of any great economic importance, and the original infestation is decreasing. The latest peaches are usually harvested before the last 3 broods are produced, and the twigs by this time are too hard for the larvae ; there is therefore a heavy mortality among those that would hibernate. *C. molesta* consequently is never likely to be a pest of major importance in this region.

Downes (W.). **Recent Developments in Strawberry Root Weevil Control.**—*J. Econ. Ent.*, xx, no. 5, pp. 695–698. Geneva, N.Y., October, 1927.

Otiorrhynchus (*Brachyrrhinus*) *ovatus*, L. (strawberry root weevil) is one of the most serious pests of strawberries on the Pacific coast. The history of previous experiments on the control of this weevil are reviewed; the most recent remedy is poisoned bait consisting of chopped dried apple waste [*R.A.E.*, A, xiv, 271; xv, 257]. In the author's experiments in British Columbia, sodium fluosilicate was found to be the most suitable poison for this purpose; it gave approximately the same results as magnesium arsenate, but it mixed better and was cheaper. Though the super-dried apple waste containing only 12 per cent. moisture can be crushed instead of chopped [xiv, 271], the super-drying deprives it of a certain amount of attractiveness, and in nearly all tests a home-made freshly chopped bait containing approximately 20 per cent. moisture gave better results [*cf.* *R.A:E.*, A, xvi, 23].

In the coastal districts the weevils eat the bait readily from the time they come out of hibernation until the middle of July, after which time the results were unsatisfactory. Two applications of the bait should be made, the first in April against the overwintered adults and the second in June against the summer brood of weevils. From 50 to 100 lb. of bait should be applied to the acre by dropping a small handful down among the crowns of the plants. The time of application, which should be, if possible, before any eggs are laid, is an important factor in the success of this method. Though the baits may prove the simplest and most satisfactory method of control, it is probable that proper crop rotation will still be necessary.

Siegler (E. H.), Brown (L.), Ackerman (A. J.) & Newcomer (E. J.). U.S. Bur. Ent. **Chemical Treatment of Bands as a Supplemental Control Measure for the Codling Moth.**—*J. Econ. Ent.*, xx, no. 5, pp. 699–701, 1 ref. Geneva, N.Y., October 1927.

Though it is believed that proper spraying is the most satisfactory means of controlling *Cydia* (*Carpocapsa*) *pomonella*, L. (codling moth), efficient auxiliary methods are desirable in regions where it is abundant. Such auxiliary measures include the use of bands for trapping the pupating larvae, and if these were impregnated with a chemical that would kill the larvae that pupate between the band and the tree trunk, the labour involved in destroying them would be obviated. In this connection a technical grade of beta-napthol ($C_{10}H_7OH$) was found to kill all the larvae that came in contact with it. This substance is slightly soluble in cold water and vaporises rather slowly at summer temperatures. Its toxic action is rather slow, requiring 2–3 weeks, so that it would not be effective unless it were rendered rainproof. A waterproof mixture was therefore made by adding 1⅓ U. S. pts. lubricating oil (red engine type) to 1 lb. of beta-naphthol. This mixture is of the consistency of paint and may be easily applied with a brush to the material to be used for banding. The bands should then be folded and put through a clothes wringer to ensure saturation of the cloth and the removal of excess material. The above quantity is sufficient for 80–90 bands 3 ft. in length and 4 inches in width when folded. As the full grown larvae are negatively phototropic and prefer to pupate under a dark coloured material, it suggested that the cheese-cloth for the band should be dyed or else a sufficient quantity of lamp black be added to the mixture.

Beta-naphthol is apparently not a strong repellent, nor is it injurious to the tree, though no detailed studies have yet been made. Further work is to be done in the hope of finding a more suitable material; in this connection a commercial brand of emulsion containing a refined white oil (85 per cent. oil) of which 95 per cent. was unsulphonated residue has given promising results. The emulsion was used at full strength on burlap bands.

Siegler (E. H.) & Brown (L.). U.S. Bur. Ent. **Preliminary Experiments in the Application of Paradichlorobenzene in Liquid Form against the Peach Tree Borer.**—*J. Econ. Ent.*, xx, no. 5, pp. 701–702. Geneva, N.Y., October 1927.

Several tests have been made using ¾ and 1 oz. of paradichlorobenzene in solution in comparison with the same amounts of the insecticide in crystalline form for the control of *Aegeria exitiosa*, Say. The crystals of paradichlorobenzene were dissolved in a high grade petrol at the rate of 50 cc. to each ounce of crystals. The solution was applied in a circle (about 2 inches from the trunk) around the base of 6-year-old peach trees in October. Upon evaporation of the solvent, the paradichlorobenzene recrystallises in a very finely divided state, being partly distributed below the soil surface. The results of only one experiment are so far published; these indicate that paradichlorobenzene is about as effective dissolved in petrol as in the form of crystals.

Holloway (T. E.) & Haley (W. E.). U.S. Bur. Ent. **Moth Borer Damage to different Varieties of Sugar Cane.**—*J. Econ. Ent.*, xx, no. 5, pp. 703–705. Geneva, N.Y., October 1927.

The following is the authors' abstract of this paper: To combat disease and other troubles in the sugar-cane fields of Louisiana varieties of cane from Java were recommended, and these were said to be resistant to *Diatraea saccharalis*, F. (sugar-cane moth borer). Field examinations indicate that they are not resistant. Nevertheless, their habit of long stubbling may reduce borer damage by reducing the number of hibernating larvae in planted seed cane. The situation is, however, complicated by other factors, such as the extensive planting of maize, which is the favourite food-plant of *D. saccharalis*.

Hadley (C. H.). **Status and Distribution of several imported Insect Pests in Pennsylvania.**—*J. Econ. Ent.*, xx, no. 5, pp. 705–708. Geneva, N.Y., October 1927.

A short account is given of some of the more important insect pests that are gradually spreading and increasing in economic importance in Pennsylvania. They are *Popillia japonica*, Newm. (Japanese beetle), *Pyrausta nubilalis*, Hb. (European corn borer), *Epilachna corrupta*, Muls. (Mexican bean beetle), and *Cydia* (*Laspeyresia*) *molesta*, Busck (Oriental fruit moth). *Plagiodera versicolor*, Laich. (willow leaf beetle) and *Hemerophila pariana*, Clerck (apple and thorn skeletoniser) have also recently been recorded from Pennsylvania, but cannot yet be considered serious pests.

CARTER (W.). U.S. Bur. Ent. **Extensions of the known Range of** *Eutettix tenellus* **Baker and Curly-top of Sugar Beets.**—*J. Econ. Ent.*, xx, no. 5, pp. 714–717. Geneva, N.Y., October 1927.

The author's abstract of this paper is as follows : A severe outbreak of the sugar-beet leafhopper, *Eutettix tenella*, Baker, during 1926, which caused heavy losses to the sugar-beet industry in the intermountain region, was accompanied by a wide dispersal of the insect. This paper records observations made on the occurrence of the leafhopper and curly-top disease during a survey undertaken in co-operation with the States of Idaho and Montana and Canada to determine the new range of the pest. It was not found in apparently favourable localities in Alberta, though it has been recorded in British Columbia [*R.A.E.*, A, xvi, 81].

HYSLOP (J. A.). U.S. Bur. Ent. **A Monthly Survey Report Form.**—*J. Econ. Ent.*, xx, no. 5, pp. 717–725. Geneva, N.Y., October 1927.

To facilitate the comparison of notes on the prevalence and economic status of the different insect pests in the United States a special report form has been prepared, the completion of which is discussed in detail. A letter was sent to various reporters asking their opinion as to the most important insect pests in the given State. The 51 replies received represent 42 States, and indicate the following, arranged in the order of their importance, as attracting most attention, the codling moth [*Cydia pomonella*, L.], cutworms, the corn ear worm [*Heliothis obsoleta*, F.], the San José scale [*Aspidiotus perniciosus*, Comst.], and grasshoppers. Most of these insects have also been reported most frequently to the Insect Pest Survey during the past 6 years, and this shows that even with the present crude material available the data received are of decided statistical value.

SCHAFFNER, Jr. (J. V.). U.S. Bur. Ent. **Dispersion of** *Compsilura concinnata* **Meig. beyond the Limits of the Gipsy Moth and the Brown-tail Moth Infestation.**—*J. Econ. Ent.*, xx, no. 5, pp. 725–732, 1 map. Geneva, N.Y., October 1927.

Surveys for *Compsilura concinnata*, Meig., outside the limits of the gipsy moth [*Porthetria dispar*, L.] and brown-tail moth [*Nygmia phaeorrhoea*, Don.] carried out during 1920–1925 are briefly reviewed, and a list of the hosts from which the parasite has been taken is given. The fly is spreading more rapidly westward than southward, and has been recovered approximately 100 miles west of the known limits of the gipsy moth infestation. The principal hosts outside this area are often pests of considerable importance, and there is no doubt that the parasite acts as a check on many of them.

HERRICK (G. W.). *Scutigerella immaculata* **Newport, a Pest in Greenhouses.**—*J. Econ. Ent.*, xx, no. 5, pp. 738–740. Geneva, N.Y., October 1927.

Scutigerella immaculata, Newp., caused considerable injury to snapdragons [*Antirrhinum*] in greenhouses in New York in February 1927. It only occurred in what is known as solid benches in which the soil is placed on the ground [*cf. R.A.E.*, A, xv, 187], as moisture is essential for its existence. The soil in the solid beds is changed every year in late June or July. The earth is left in the field for 2 years and then used again. *S. immaculata* was found to survive throughout the year in this soil out of doors and is thus reimported into the greenhouse. A miscible solution of carbon bisulphide has been used at the rate of 1 gal. to 100 gals. of water for drenching the earth that has just been brought in from the fields and placed in the beds. Of the diluted mixture, 100 U.S. gals. used on a bed about 100 ft. long and 3 ft. wide appeared to cause 100 per cent. mortality. In a similar bed treated with half the above strength the ratio of living to dead individuals was about 1 to 3, enough to provide for an infestation in time to prevent the production of a full crop of flowers.

CHANDLER (S. C.). **Second Brood of Plum Curculio** (*Conotrachelus nenuphar*) **reared in Illinois.**—*J. Econ. Ent.*, xx, no. 5, p. 740. Geneva, N.Y., October 1927.

In connection with the discussion on the necessity of including poison for *Conotrachelus nenuphar*, Hbst., in late peach sprays, observations in Illinois indicate that the adults of a second generation begin to emerge on 20th August.

LIST (G. M.) & LANGFORD (G. S.). **Occurrence of Hessian Fly in Colorado.**—*J. Econ. Ent.*, xx, no. 5, p. 740. Geneva, N.Y., October 1927.

Mayetiola (*Phytophaga*) *destructor*, Say, is recorded for the first time from Colorado. In several fields as much as 10–12 per cent. of the wheat was damaged, the average for the infested area being about 3 per cent.

FELT (E. P.). **Oak Pill Gall,** *Cincticornia pilulae.*—*J. Econ. Ent.*, xx, no. 5, pp. 740–741. Geneva, N.Y., October 1927.

A serious local infestation of pin oak by *Cincticornia pilulae*, Walsh, is recorded from Kentucky. Some of the trees were seriously affected and had a scanty pale foliage. Many of the leaves examined had 20–30 galls on them, almost completely hiding the normal tissue. The condition was worse in the top of the tree.

GREEVES-CARPENTER (C. F.). **A Stationary Spraying System.**—*J. Econ. Ent.*, xx, no. 5, p. 741. Geneva, N.Y., October 1927.

The installation and working of a stationary spray plant in New Jersey is briefly described [*cf. R.A.E.*, A, xv, 182].

New South Wales: Plant Diseases Act, 1924. Regulations nos. 27-31.—*Govt. Gaz.*, no. 168, reprint, 2 pp. Sydney, 25th November 1927.

On account of bunchy top and of *Cosmopolites sordidus* (banana borer) no plant of the genus *Musa* may be moved from or within a quarantine area without a permit. Any *Musa* plant within such area affected with bunchy top, or that has been neglected for six months, must be dug up, the stems split longitudinally, and the corms sliced into sections not exceeding 1 inch in thickness, or, if permitted, the destruction of the plants may be carried out by introducing cattle on the land. In certain areas, plants to be destroyed must first be sprayed with a solution obtained by diluting nicotine sulphate with water in the proportion of not less than 1 pint nicotine sulphate to 800 pints water, or by steeping waste tobacco in water for not less than 36 hours in the proportions of not less than 12 lb. tobacco to 30 gals. water and adding washing soda, 5 oz. soda to 30 gals. of the infusion.

NEWMAN (L. J.). **Spring Beetle Investigation. (Family : Scarabeidae; Genus :** *Colymbomorpha*; **Specific Name:** *Colymbomorpha lineata* **(Blk.).)**—*J. Dept. Agric. W. Aust.*, (2) iv, no. 3, pp. 418–420. Perth, W.A., September 1927.

Colymbomorpha lineata, Blkb. (spring beetle) occurs over large areas in Western Australia; the adults feed on the pollen, nectary glands and petals of the flowers and on the young fruit in orchards. They are present in early spring for about 6 weeks. As this is the time of the ploughing in of all weeds and the orchards are constantly cultivated throughout the summer, conditions there are rendered unfavourable for breeding. As a result the larvae have never been found in orchards, and it has been definitely determined that the beetles swarm into them from the surrounding country. The larvae feed on the roots of grasses and other plants and pupate in earthen cells in the ground.

Injury due to this beetle has been increasing during recent years, probably owing to the fact that natural food-plants have been removed during the process of clearing. In the insectary, in which it is very difficult to rear this insect, the length of the adult life is 10–16 days, and the number of eggs deposited in the field is probably from 40 to 60.

Weather conditions are a great factor in the control of *C. lineata*; a cool wet spring will retard the development of the beetle and prevent its appearance in serious numbers. Three good sprayings, at intervals of 16 days, should be sufficient to control it. One of the following mixtures may be used: 1 lb. lead arsenate, and $\frac{1}{4}$ lb. molasses or $\frac{1}{2}$ lb. flour (which gave slightly better results) to 8 gals. water; 1 oz. Paris green, 2 oz. molasses, $\frac{1}{2}$ lb. quicklime and 10 gals. water, this mixture being cheap and effective, though it must not be used when the trees are in bloom; 11 oz. soap, 8 oz. lead arsenate and 4 gals. water, this being a mixture that should be applied hot, the soap having an immediate effect on the pest while the poison remains on the foliage for a subsequent invasion; and 11 oz. soap in 4 gals. water (with or without 2 tablespoons turpentine), which should also be applied hot. If the trees are jarred when the contact wash is used, so that the beetles fall to the ground and may be drenched there, a good deal of spray may be saved.

NEWMAN (L. J.). **Lucerne Flea.** (*Sminthurus viridis.*)—*J. Dept. Agric. W. Aust.*, (2) iv, no. 3, pp. 449–451. Perth, W.A., September 1927.

Smynthurus viridis, L. (lucerne flea) is a severe pest of clover in Western Australia. The Collembola appear when the plants are in the cotyledon stage; they make small irregular holes in the seed leaves, and when infestation is heavy, the entire leaf may be eaten.

Animals will not feed where they are numerous. They are only present during the wet season, appearing with the rains in mid-May and disappearing with the advent of the warm dry weather in October, so that clover outgrows the attacks and yields a crop in the late spring, though the first crop, which is relied upon to provide the early feed for animals put out to pasture, is destroyed.

This pest also feeds on peas, lucerne, and other succulent plants, and readily spreads from infested areas to clean ones ; it is therefore very difficult to control. Attacks may be largely prevented by keeping the land free from weeds, up to the time of sowing ; this will ensure that the clover will be unifested when the seed germinates. Migration from surrounding infested areas may then be checked by encircling the crop with a strip of clean fallow 35–40 ft. wide, which should be well worked and may be treated with lime to maintain a loose mulch over which the insects will not readily travel. Weeds growing along the fences and on the headlands should be removed ; it is also advisable to divert surface water from the fields. Infested fields may be burned over with a quick fire, as this does not destroy the clover seeds.

Treatment for *S. viridis* should be applied as soon as possible after its first appearance, and one of the following sprays may be used : 4 lb. soap, shredded and dissolved by boiling, 1 pt. 40 per cent. nicotine sulphate and 80 gals. water thoroughly mixed together, and applied cold with a spray pump; or 8 oz. dissolved soap, and 8 tablespoons of turpentine, the whole mixture being brought up to 4 gals. by the addition of hot water and then applied hot. A mixture of 3 lb. lead arsenate and 40 gals. water may be sprayed over the infested area, but vegetables and foliage treated within 3 weeks of cutting must be well washed before being eaten, and stock should not be pastured until a similar period has elapsed; 1 lb. 15 per cent. carbolic powder to 4 lb. lime, superphosphate of lime or other diluent constitutes an effective dusting powder ; 1 lb. crushed or flaked napthalene to 3 lb. lime or other diluent is also effective, the napthalene giving off a gas that is deadly to the insect, while it cannot injure plants if applied without a diluent, since it is insoluble in water. *S. viridis* may also be controlled by tarred screens or shallow trays drawn through the fields ; these are so arranged that the draft is to one side as in a harvesting machine, and the insects, when disturbed by the horses, do not hop out of the range of the screen but are carried on to the tarred surface.

When the pest becomes widespread over vast areas, artificial control is not economically possible, and the only hope lies in the discovery and introduction of a natural parasite.

PARKER (H. L.). **Recherches sur les formes post-embryonnaires des Chalcidiens.**—*Ann. Soc. ent. Fr.*, xciii, pp. 261–379, 39 pls., 7 pp. refs. Paris, 1924.

This valuable paper is the result of several years' study undertaken at the United States Parasite Laboratory in the south of France, very little being previously known of the immature stages of Chalcids. A systematic description is given of the eggs and larval forms, with a comparative study of the external and internal morphology of the larvae, and some notes on the larval form in its relation to ethology and systematics. It is found that the larvae of this group present great uniformity of structure, apart from certain special types such as

Perilampus and *Schizaspidia*, or *Brachymeria* (*Chalcis*) and *Aspidiotiphagus*, and moreover, whatever may be the characters of the primary larva, the later stages invariably resemble each other, so that the mature larva always shows the same general form irrespective of the conditions of its earlier life. The mature larva of an internal parasite shows no difference from that of an external one.

An index to the species dealt with is given.

THÉRY (A.). **Un nouvel ennemi du cotonnier dans l'Afrique tropicale.**—*Bull. Soc. Sci. nat. Maroc*, vii, no. 1–3, pp. 8–10, 1 fig. Rabat, 31st March 1927.

In a recent monograph on the insect pests of cotton [*R.A.E.*, A, xiv, 457], only one species of Buprestid [*Sphenoptera gossypii*, Cotes] was recorded. A species of *Anthaxia* taken on this plant at Khartoum has proved to be the well-known Senegalese species, *A. binotata*, Chevr., of which *A. aurata*, C. & G., is only a variety. The spread of this beetle in north Africa seems highly improbable, unless it is introduced accidentally, but other polyphagous species of *Anthaxia* may adapt themselves to cultivated cotton and become very destructive by the larvae boring in the stems. The original description and figure are revised.

CAUSSE (P.). **Résultats obtenus dans la lutte contre tous les insectes ampélophages et observations sur le pH du sol.**—*Bull. agric. Algérie*, xxxiii, no. 10, pp. 190–192. Algiers, October 1927.

Insects attacking those parts of the vine that are above ground were successfully controlled by weekly applications of dust consisting of lime or calcium sulphate from the time the buds began to open until the beginning of the vintage. The crop on a few vines left untreated was completely destroyed by *Clysia ambiguella*, Hb., and *Polychrosis botrana*, Schiff. These dusts can be employed simultaneously with applications of sulphur or copper sulphate dust against mildew and obviate the use of arsenicals. Where the soil is highly alkaline, it is preferable to use calcium sulphate rather than slaked lime, which is also likely to cause injury to workers using it. The author considers that the pH content of the soil plays a preponderating part from the point of view of fertility. The introduction of material having an acid reaction secures good results in calcareous soils, and the contrary is probably true of soils defective in lime. Excellent results have been obtained in calcareous soil from the use of iron sulphate at the base of the stocks.

SILVESTRI (F.). **Contribuzione alla conoscenza degli Aleurodidae (Insecta: Hemiptera) viventi su *Citrus* in Extremo Oriente e dei loro parassiti.** [A Contribution to the Knowledge of the Aleurodidae living on *Citrus* in the Far East and of their Parasites.]—*Boll. Lab. Zool. Portici*, xxi, pp. 1–60, 34 figs. Portici, 5th November 1927.

In this account of Aleurodids infesting *Citrus* in the Far East, brief particulars of the distribution and biology are given for each species.

The second part describes the following Chalcidoid parasites found on them with biological notes :—*Prospaltella smithi*, Silv., from *Aleurocanthus spiniferus*, Quaint., in China and *A. woglumi*, Ashby, in Ceylon ; *P. divergens*, Silv., from *A. woglumi* in Singapore ; *P. ishii*, Silv., from *A. spiniferus* in China; *P. clypealis*, sp. n., and *P. opulenta*, sp. n., from *A. inceratus*, sp. n., in Indo-China ; *P. citrofila*, sp. n., from *Dialeurodes citri*, R. & H., in Indo-China ; *P. strenua*, sp. n., from *Bemisia giffardi*, Kotinsky, in China ; *P. perstrenua*, sp. n., from *D. citrifolii*, Morg., in Indo-China ; *P. armata*, sp. n., from *Aleurolobus subrotundus*, sp. n., in Indo-China ; *Encarsia merceti*, Silv., from *Aleurocanthus woglumi* in Singapore ; *E. nipponica*, sp. n., from *A. spiniferus* in Japan ; *E. persequens*, sp. n., from *Aleurocybotus setiferus*, Q. & B., in the Philippines ; *Eretmocerus serius*, sp. n., from *Aleurocanthus woglumi* in Singapore ; *Ablerus macrochaeta*, sp. n., from *Aleurocanthus inceratus* in Indo-China, probably however, a hyperparasite through *Prospaltella opulenta* ; *A. connectens*, sp. n., from *Aleurocanthus woglumi* in Ceylon; and *Amitus hesperidum*, sp. n., from *Aleurocanthus citriperdus*, Q. & B., of which it appears to be a specific and important parasite, in China and Singapore.

LOMBARDI (P. L.). **Per combattere il dermeste.** [Measures against *Dermestes*.]—*Boll. R. Staz. sperim. Gelsic. e Bachic.*, vi, no. 4–5, pp. 191–197. Ascoli Piceno, August–October 1927.

Dermestids are a pest in the silkworm farms in Italy owing to the larvae destroying the cocoons. An effective measure, recommended many years ago and apparently forgotten, consists in closing with plaster all cracks and larval bore-holes in the wooden trays, shelving, etc., thus preventing the exit of the beetles. The sealing may be effected at any time between early autumn and spring, and is conveniently done when the annual overhaul and cleaning of the wooden plant is being carried out.

MALENOTTI (E.). **Fumigazioni estive al pero.** [Summer Fumigation of the Pear.]—*Italia agric.*, September 1927, reprint 6 pp., 2 figs. Piacenza, 1927.

As a result of the success attending winter fumigation with hydrocyanic acid gas against *Epidiaspis piricola*, Del Guerc., in North Italy [*R.A.E.*, A, xv, 480], experiments on the same lines have been made in summer. The measure has proved a practicable one, no harm being caused to pear trees even at the maximum dose of 6 grams of sodium cyanide per cubic metre at a temperature of 22–23° C. [71·6—73·4° F.], and quite as effective, a mortality of 997 per mille being attained. Summer treatment is cheaper than winter treatment as only one-third to one-fourth the amount of sodium cyanide is needed. Near Verona, where the tests were made, the best time is in June, only a few eggs being present. Most of the eggs are killed even by the smaller summer dosage. The fumigation also proved very effective against the larvae of *Caliroa limacina*, Retz. (*Eriocampa cerasi*, auct.).

VAN BREEMEN (P. J.). *Aphis maidis* **op suikerriet bij Pasoeroean.** [*A. maidis* on Sugar-cane at Pasoeroean.]—*Meded. Proefst. Java-Suikerind.*, no. 12, pp. 557–577. Soerabaia, 1927.

In further observations with sticky screens for recording the occurrence of *Aphis maidis*, Fitch, in sugar-cane fields [*R.A.E.*, A, xiv, 592], screens measuring about 1½ by 2 ft. were used both in the rainy and dry seasons. Some time after the onset of the rains, *A. maidis* begins to infest young cane, which appears to be preferred by the winged females. The infestation rapidly reaches it maximum, after which the number of wingless individuals quickly drops. The main infestation lasts for about two months, but during the greater part of this period wingless individuals are scarce, both as regards distribution throughout the plantation and numbers on the plants. Fresh cases of infection with mosaic usually appear after *A. maidis* has nearly or quite disappeared.

VAN BREEMEN (P. J.). **Verdere waarnemingen omtrent het zwermen van *Aphis maidis*, Fitch.** [Further Observations on the Swarming of *A. maidis*.]—*Meded. Proefst. Java-Suikerind.*, no. 14, pp. 583–588. Soerabaia, 1927.

Further observations on *Aphis maidis*, Fitch, on sugar-cane at Pasoeroean [*R.A.E.*, A, xiv, 592] confirm the previous results. There is a sporadic infestation during the dry season up to the end of December, followed by a rapid increase during the rainy season. The date of the beginning of the rains influences the date of the beginning of the appearance of winged individuals in large numbers. All mosaic-infected plants must be cleared away before this occurs, and at Pasoeroean this should be 14 days after the beginning of the rainy season.

A. sacchari, Zehnt., was most abundant in November, as usual. The enormous flights of *A. gossypii*, Glov., observed in June 1925, did not occur during the dry season of 1926, though an increase was noticed in September and October.

LEEFMANS (S.). **Gegevens over sabelsprinkhanen als cocosvijanden in Nederlandsch-Indië en hunne parasieten.** [Tettigoniids as Coconut Pests in the Dutch East Indies and their Parasites.]—*Meded. Inst. PlZiek.*, no. 72, 95 pp., 15 pls. Buitenzorg, 1927. (With a Summary in English, pp. 85–90.)

During the past ten to thirty years certain Tettigoniids have become serious pests in coconut plantations in the Talaud Islands in the North of the Dutch East Indian Archipelago. *Sexava nubila*, Stål, and *S. coriacea*, L., are common, while a third species, *S. karnyi*, Leefm., occurs only in the island of Poat (or Poeah). Their classification and distribution are discussed. A description is given of all stages of *S. nubila* and of the bionomics of this species and of *S. coriacea*. The injury by *S. nubila* to coconut is very severe; the palms may be entirely stripped of the leaflets, and the inflorescences and fruits are damaged. *S. nubila* has a marked preference for the leaves of coconut, sago and other palms, but also attacks *Pandanus*, bananas, certain Zingiberaceae and, in captivity, grasses. All stages are markedly nocturnal in habit. *S. nubila*, like *S. coriacea*, is a weak flyer and merely uses its wings as parachutes. Normally, about 95 per cent. of the eggs are laid in the ground, usually at a depth of a few centimetres, and about 5 per cent. in the crowns of the palms, but the latter figure may rise if the ground is too hard or very wet. A female laid 53 eggs during 26 days in captivity. The egg stage lasts over one month and not improbably may exceed two. On hatching, the young ascend the coconut trunks. Small scale experiments indicate that banding may be useful. A heavy oil residue seems better than tanglefoot for the bands, for though it does not remain sticky for so long, it is very much cheaper and captures more of the insects.

A visit paid to Amboina in search of parasites resulted in two Chalcidoids being bred from the eggs ; these are both primary, but overlap so that they are competitors to some extent. The larger parasite appears to be an Encyrtid and is the more efficient ; a maximum of 42 per cent. of a limited number of eggs in Amboina was parasitised by it. In the island of Batjan a maximum of 51 per cent. was observed. The early stages of this parasite are described. The larvae are shuttle-shaped, clearly segmented, 3 mm. long and 1 mm. thick. Development takes from 5 to 7½ weeks. The number of parasites in one egg averaged 27, with a maximum of 60. There were 7·3 males to 92·7 females, and every parasitised egg of the host contained one or more males. Parasitised material was brought from Amboina to Karakélong, the largest island of the Talaud group, and one year later the parasite was found to have spread some distance from the localities where liberation had taken place. The highest amount of parasitism observed was 4 per mille. The smaller, less important parasite seems to be a Trichogrammatid. At Halmahera a third parasite was found ; it is probably a Eulophid. A fungus, apparently parasitic, was found on *Sexava* eggs from different islands ; up to 55 per cent. in Karakélong being infected with it. While time is given for the parasites to become established, such agricultural measures as draining, cleaning and manuring the plantations may be continued, with the local remedial measures (near and in the villages) of collecting the eggs and the adult insects.

[Kiper (V.).] **Кипер (В.). The Apple Moth,** *Hyponomeuta malinellus*, **Zell.** [*In Russian.*]—*Sel.-Khoz. Byull.* [*Agric. Bull.*], no. 5, pp. 9–10, no. 6, pp. 9–10. [Kishenev] February & March 1927.

This is a popular account of the life-history and control of *Hyponomeuta malinellus*, Zell., which is widely distributed on apples in Bessarabia. Various proprietary insecticides, as well as Bordeaux mixture and arsenicals, are recommended for its control.

[Vereshchagin (B.).] Veresceaghin (B.). **Agricultural Pests in Bessarabia during 1926.** [*In Rumanian.*]—*Viata agricola*, 1927, no. 13–14, pp. 343–349. Bucharest, July 1927.

The insect pests recorded in this report and not recently noticed [*R.A.E.*, A, xii, 440 ; xiii, 319 ; xiv, 566] include : The vine pests, *Psalidium maxillosum*, F., and *Polyphylla fullo*, L. ; the orchard pests, *Psylla pyrisuga*, Först., *Anuraphis kochi*, Schout. (*Aphis pyri*, Koch) and *Caliroa limacina*, Retz. (*Selandria adumbrata*, Klg.) on pears, *Hyalopterus arundinis*, F. (*pruni*, F.) on plum, *Hyponomeuta euonymellus*, L., on apple, and *Coleophora hemerobiella*, Scop. ; and the grain pests, *Zabrus tenebrioides*, Goeze, and *Anisoplia segetum*, Hbst. Other pests include *Melasoma* (*Lina*) *tremulae*, F., on willows, and *Aspidiotus hederae*, Vall., on palms and oleanders indoors.

[Lezhava (V. V.).] **Лежава (В. В.).** *Pyrameis cardui*, **L., as a Pest of Cotton. (Preliminary Paper.)** [*In Russian.*]—*Khlopkovoe Delo* [*Cotton Industry*], vi, no. 3–4, pp. 218–219. Moscow, March–April 1927.

Pyrameis cardui, L., is recorded from Georgia as attacking cotton. Though the larvae would not feed under experimental conditions on the leaves or any other part of the plants, they were observed in the field feeding voraciously on the bracts and leaves, the latter being preferred.

[Lezhava (V. V.).] **Лежава (В. В.).** *Otiorrhynchus fausti*, **Stierl., as a Pest of Cotton. (Preliminary Paper.)** [*In Russian.*]—*Khlopkovoe Delo* [*Cotton Industry*], vi, no. 5–6, pp. 392–393. Moscow, May–June 1927.

Otiorrhynchus fausti, Stierl., has been found feeding on the leaves of cotton in the field in Georgia, though the damage so far observed has been negligible.

[Nikol'skiĭ (V. V.).] **Никольский (В. В.). Disinfection of Cotton Bales in Vacuum Apparatus.** [*In Russian.*]—*Khlopkovoe Delo* [*Cotton Industry*], vi, no. 9–10, pp. 712–729, 13 figs., 4 refs. Moscow, September–October 1927.

Owing to the importance of preventing the importation of *Platyedra gossypiella*, Saund., into the cotton-growing areas of Russia, the protection afforded by vacuum fumigation in the United States is discussed, the apparatus used being described.

[Radugin (P. A.).] **Радугин (П. А.). Control of Locusts in the Territories of Persia, Afghanistan and China adjoining Russia.** [*In Russian.*]—*Khlopkovoe Delo* [*Cotton Industry*], v, no. 9–10, pp. 676–680. Moscow, September–October 1926. [Recd. 1928.]

Russian territories bordering on Persia, Afghanistan and China are periodically invaded by locust swarms coming from the latter countries, which makes the control work in these territories very complicated. In 1923 survey and control work was organised in northern Persia, bordering on Transcaucasia, and in 1925 the survey was extended to the Khorasan province of Persia, bordering on Transcaspia, and northern China; control work was organised in Khorasan in 1926. Some swarms of *Dociostaurus maroccanus*, Thunb., from Afghanistan, invaded Russian territory in 1926, but so far there is no agreement with that country.

[Uvarov (B. P.).] **Уваров (Б. П.). New Data on the Locust Problem.** [*In Russian.*]—*Khlopkovoe Delo* [*Cotton Industry*], v, no. 11–12, pp. 837–845, 7 refs. Moscow, November–December 1926. [Recd. 1928.]

This is a review of current literature on the bionomics, periodicity and control of locusts.

Fey (K. Y.). **Outbreak of Locusts in Chekiang.** [*In Chinese.*]—*Pop. Bull. Bur. Ent. Chekiang*, no. 20, poster, 4 sheets, figs. Kashing, September 1927.

Outbreaks of locusts are more common in central China (north of the Yangtsze) than in the province of Chekiang, where, however, in August 1927, migratory locusts, chiefly *Locusta migratoria* ph. *migratorioides*, caused serious losses to crops. Brief accounts of the simple control measures adopted are given.

Headlee (T. J.). **Report of the Department of Entomology.**—*Rep. New Jersey Agric. Expt. Sta. 1925–26*, pp. 151–237, 10 figs. New Brunswick, N.J., 1927.

In addition to a classified list of all insect pests recorded in New Jersey during the year under review, notes are given on insects of particular economic importance, many of which were noticed in the previous report [*R.A.E.*, A, xv, 300].

Some general conclusions are set forth in regard to the relation existing between climate and insect activity, the economic value of which lies in the resulting ability to forecast insect outbreaks within the present area of distribution and to forecast distribution of species beyond their present range, and in increased knowledge of the methods of using artificial and natural methods of control.

A study of the body moisture, fats and nitrogen occurring in *Malacosoma americana*, F. (apple tent caterpillar) throughout its life-cycle, carried on by W. Rudolfs, showed that the water content of the egg, beginning about 48·5 per cent., decreased until hatching, when it reached 39·4 per cent. In the larva it rose, reaching 85·1 per cent. at the end of the second instar. It remained at about this figure till pupation, when it dropped to 71. When the adults appeared it had decreased to about 60 per cent. These facts serve to indicate that body water requirements for *M. americana* as compared with the egg stage are about 40 per cent. greater in the larval stage, 26 per cent. greater in the pupal stage and 15 per cent. in the adult stage. The fat is almost consumed in the egg, but it is built up again during the larval stage with particular rapidity as completion of growth approaches. The process of pupation and formation of the adult does not exhaust it, but leaves to the adult a supply adequate to mature the eggs and to equip them with a reserve of food. The relation of nitrogen to body weight is about the same throughout the cycle, except at the time of hatching, when nearly all stored food has been used and fresh food has not yet become available. The small increase in nitrogen that appears in the adult may be necessary for the formation of egg shells and cover.

Comparative tests of three different methods of timing sprays for the control of larvae of *Cydia pomonella*, L., entering the side of the fruit, consisting of observations of the emergence of hibernating larvae confined in glass tubes in cages, records of the number of adult moths found in bait pans in the orchards, and calculations based on thermal constants, showed that in the case of light infestations the thermal constant used in conjunction with cage records constitutes a good indicator of the time when spraying for larvae of the first brood should be carried out. The time for application of spray to control larvae of the second brood was ascertained by placing adult larvae of the first brood collected from burlap bands in separate glass tubes in the cage and observing the moment of maximum emergence. Where the infestation of unsprayed fruit does not exceed 50 per cent. of the picked fruit, the combination of these two methods is of particular value, as one thorough application of spray resulting in coating the fruit, made immediately after the time of maximum emergence of the first brood and just previous to the maximum emergence of the second, effects a satisfactory control of injury from each.

Examination of bait-pan records shows that while they may be taken as an index of the presence or absence of the moth in the orchard where they are placed, they cannot be depended upon to indicate clearly and unmistakably the period of maximum emergence. The bait-pan indicator, however, is valuable in cases where, in consequence of severe infestation in previous years, it is necessary to keep the fruit entirely coated with film during the period of entry by the larvae of both the first and second broods, the moment for the application of the sprays being indicated by the appearance of the adults in the traps, and treatment being subsequently continued until no further moths are observed in them.

An account previously noticed from another source [*R.A.E.*, A, xv, 259] is given of practical work carried out in New Jersey against *C. pomonella* in 1925–26. Details of the spraying schedule used in the course of this work are given.

The results of field experiments in the control of the eggs of the European red mite [*Paratetranychus pilosus*, C. & F.] carried out during the winter of 1925–1926 showed that oil emulsions are about twice as toxic as miscible oils on the basis of percentage of oil. No scorching of buds occurred on peach or apple following delayed dormant spraying. The high standard of control secured all over the State was aided by weather conditions unfavourable to the development of *P. pilosus*. In view of the methods of application in general use, an increase in the oil content of the diluted oil sprays, at present 2 per cent. in the case of emulsions and 4 per cent. in the case of miscible oils, is recommended.

Most of the information on the raspberry crown borer [*Pennisetia marginata*, Harr.] has already been noticed from another source [*R.A.E.*, A, xiv, 449]. Data secured in an experiment carried out in the spring of 1926 indicate that nicotine in the form of tobacco dust is far more efficient than 40 per cent. nicotine sulphate in controlling the borers. A great increase in efficiency was secured by the use of an iron ring, 14 ins. in diameter, with which the hills were surrounded, and into which 1 U.S. gal. water was poured, after the tobacco dust had been sifted into it and covered with a thin coating of soil. The tobacco dust used was about 100 mesh.

STEARNS (L. A.). **A Report of the Investigation of the Oriental Peach Moth** (*Laspeyresia molesta*, **Busck**) **for 1925.**—*Rep. New Jersey Agric. Expt. Sta. 1925–26*, pp. 184–195, 7 figs., 1 ref. New Brunswick, N.J., 1927.

Data secured in 1925 in the course of biological studies of *Cydia* (*Laspeyresia*) *molesta*, Busck (oriental peach moth) in the insectary, on caged trees and under general orchard conditions confirm those obtained in the previous year [*R.A.E.*, A, xv, 302]; three complete broods and a partial fourth brood occurred in both years under insectary conditions, slight differences in the emergence periods being due to seasonal variations in temperature. Records are given of parasitism in various localities in 1925, when an unusually extensive outbreak of parasites occurred. A list of 21 primary parasites and one secondary parasite reared from *C. molesta* in New Jersey in 1925 is given, the more important being *Macrocentrus ancylivora*, Rohw., which was by far the most numerous, *Glypta rufiscutellaris*, Cress., *Calliephaltes* sp., *Pristomerus ocellatus*, Cush., *Cremastus minor*, Cush., *C. forbesii*, Weed, *Phanerotoma tibialis*, Hald., *Ascogaster carpocapsae*, Vier., *Calliephaltes grapholithae*, Cress., and *Eubadizon* sp. The results of experiments in controlling *C. molesta* in 1924 and 1925, together with others carried out subsequently, have been noticed elsewhere [*R.A.E.*, A, xiii, 252; xv, 260, 261, 302]. The average increase in clean fruit resulting from fungicidal-arsenical-nicotine treatment [*R.A.E.*, A, xiii, 254] in 1925 was 8·65 per cent. as compared with 13 per cent. in 1924, the variations in the results being probably due to parasitism and the earlier autumn in 1925.

HAMILTON (C. C.). **Some Tests of Para-dichlorobenzene dissolved in Soluble Pine Tar Creosote in the Control of boring Insects in Living Plants.**—*Rep. New Jersey Agric. Expt. Sta. 1925–26*, pp. 196–199, 1 ref. New Brunswick, N.J., 1927.

An account is given of some previous work in the use of tar oils as remedies for boring insects in living plants in the United States, where, probably owing to difficulty of application and somewhat inadequate results, these materials have received little attention. Good results were, however, secured in New York in 1914 against *Cryptorrhynchus lapathi*, L., attacking willow and poplar [*R.A.E.*, A, iv, 69], while in 1921 the author secured control of all stages of a bark-beetle attacking growing pines in Maryland 10 days after the application, by spraying the trunks, of a mixture at the rate of 1 lb. paradichlorobenzene to 1 U.S. qt. soluble pine-tar creosote, diluted with equal parts of water, although many of the entrance holes were partly closed with resin. Paradichlorobenzene has also been used dissolved in kerosene against insects infesting cut logs [*R.A.E.*, A, xi, 263].

In September 1925 the larvae of *Euzophera semifuneralis*, Walk., were discovered attacking the trunks of linden [*Tilia*], from ground level to a height of 15 ft. or more, feeding on the outer and inner bark and cambium layer and spinning silk with which the borings were held together. The larvae were not observed to feed upon the woody tissues. Twelve days after spraying 5 trees with 4 or 5 U.S. gals. of a solution at the rate of 1 lb. paradichlorobenzene dissolved in 1 U.S. pt. pine-tar oil, heated to 120° F., at which temperature the crystals readily melt, diluted with 2 parts of water, no living larvae or places where borings were being pushed through crevices in the bark could be discovered. The tar-oil had penetrated to all places where the larvae had bored in the bark or pithy growth caused by their presence and had in some cases followed their burrows for several inches, without causing apparent injury to the trees.

The same mixture was successfully used against *Cryptorrhynchus lapathi*, L., on willow in June 1926. A fortnight after treatment with stock solution diluted with 2 parts water, three living pupae and one full-grown larva were found on a limb that had harboured about

75 larvae, while trees treated accidentally with an undiluted solution failed to show any living larvae seven days later and no injury resulted to the living wood.

GINSBURG (J. M.). **Chemical Studies of the New Jersey Dry-Mix Spray in Relation to Arsenical Injury.**—*Rep. New Jersey Agric. Expt. Sta. 1925–26*, pp. 199–206, 1 pl., 4 refs. New Brunswick, N.J., 1927.

The greater part of the information contained in this paper on the formation of water-soluble arsenic in lead arsenate and sulphur-lime dry-mix sprays has already been noticed from other sources [*R.A.E.*, A, xv, 83; xvi, 84]. Tests in which a number of chemicals were substituted for hydrated lime in the spray mixture showed that with the oxides of zinc, iron and aluminium, and charcoal less soluble arsenic was formed than with equal quantities of $Ca(HO)_2$. With the addition of 2 lb. zinc oxide, half as much soluble arsenic was formed as with 4 lb. hydrated lime; while with 8 lb. zinc oxide no soluble arsenic could be detected. Though no injury to plants was observed in greenhouse tests with this mixture, field experiments in which 2 lb. and 4 lb. zinc oxide was substituted for hydrated lime resulted in severe scorching and defoliation. When 3–4 lb. zinc oxide alone was added to 50 U.S. gals. water, damage amounting in some cases to 20 per cent. of the total leaves occurred on sprayed peach and apple trees. The characteristics of injury caused by zinc oxide as distinct from arsenical scorching are described. Though no injury to plants was observed from the substitution of ferric oxide, aluminium oxide or charcoal for hydrated lime in the dry-mix spray, no definite conclusions have yet been arrived at in regard to these materials.

GINSBURG (J. M.). **Investigation of Stickers in Dusting Mixtures.**—*Rep. New Jersey Agric. Expt. Sta. 1925–26*, p. 206. New Brunswick, N.J., 1927.

Two methods, consisting of incorporating in the sulphur-arsenical dust an insoluble substance, that possesses very adhesive qualities, and of covering the dust with a fine spray of a very viscous and sticky liquid such as oil, were employed during these investigations, of which only a brief note is given. A special apparatus was devised and constructed for the preparation of the dust. Among chemicals tested, stearates, palmitates and resinates of zinc and of copper proved of particular value. These soaps, which possess great adhesive qualities and can be prepared in the form of very fine, fluffy powders, are superior to sodium and potassium soaps in that they are very insoluble and do not react with the lead arsenate of the dust mixture, thus eliminating the possibility of forming soluble arsenic on the foliage.

GINSBURG (J. M.). **Oil Sprays and Emulsifiers.**—*Rep. New Jersey Agric. Expt. Sta. 1925–26*, pp. 206–208. New Brunswick, N.J., 1927.

Preliminary laboratory tests suggested that the emulsifying agent might be mainly responsible for the variations in results obtained with miscible oils and oil emulsions, the latter being far more effective in destroying the eggs of red mite [*Paratetranychus pilosus*, C. & F.], though the former are more expensive.

Tests of commercial samples as well as of laboratory prepared emulsions, diluted with water so as to contain only 2 per cent. of oil, showed that the highest percentage of kill is obtained with mixtures in which the oil is released gradually on the surface of the liquid, such as those obtained with fish-oil soaps, skim milk, egg or albumin, regardless of whether the spray was a miscible oil or an oil emulsion. Miscible oils that hold the oil in permanent suspension, such as those obtained from oleates of ammonium and potassium, produce an unsatisfactory degree of control, while the poorest percentage of kill is afforded by emulsions releasing their oil quickly upon dilution, such as those prepared with resinates, colloidal clay or casein. These results suggest that the superiority of oil emulsions over miscible oils is due to the fact that they release their oil gradually while the homogeneous mixture afforded by miscible oils possibly prevents intimate contact between the oil and the sprayed surface. [*Cf. R.A.E.*, A, xv, 625.]

Tests carried out on peach trees in New Jersey showed that while ordinary lubricating oil caused defoliation varying from 10 per cent. at a strength of 0·25 per cent. to 90 per cent. at a 2 per cent. concentration, the injury caused by the application of a highly refined commercial oil was not significant with concentrations below 5 per cent. With increasing concentrations, however, scorching became more pronounced.

Refined oils are primarily distillates from which the unsaturated hydrocarbons of the oleifine series as well as of those of the aromatic series have been removed by a process of sulphonation. They consist mainly of hydrocarbons of the paraffin series. While the causative agent of oil injury has not been established, the fact that the highly refined oils are very much less toxic to foliage than are the unrefined ones suggests that either the unsaturated or aromatic hydrocarbon may be responsible for foliage scorching.

Hamilton (C. C.). **The Distribution, Quantity and Adherence of Lead Arsenate deposited in Field Spraying in their Relation to Twig and Leaf Growth.**—*Rep. New Jersey Agric. Expt. Sta. 1925–26*, pp. 209–212, 3 figs. New Brunswick, N.J., 1927.

An abstract of this paper has already been noticed [*R.A.E.*, A, xv, 432].

Contrary to expectation, the quantity of lead arsenate to the unit of leaf area decreased as the spraying season advanced up to 4th June, the rapid increase in leaf area more than offsetting any accumulation due to successive spraying. After the leaf growth slowed up, however, the proportion of lead arsenate began to rise rapidly, considerably more being deposited on the lower part of the trees than on the upper. Less than the expected difference was found on foliage examined just before and immediately after spraying. At the end of the season leaves developing previous to 7th May, which had received 4 or 5 applications of spray, had less lead arsenate to the unit of leaf area than those developing between 7th and 19th May, during which period 3 applications were made. After the latter date, between which and 4th June 2 applications were made, the quantity to the unit of leaf area in new growth fell rapidly, while leaves developing between 4th June and 23rd June, which received one application, showed a continuance of this decrease.

Beckwith (C. S.), Driggers (B. F.) & Jones (C. D.). **Report of the Cranberry Substation.**—*Rep. New Jersey Agric. Expt. Sta. 1925–26*, pp. 215–229, 2 refs. New Brunswick, N.J., 1927.

An experiment in New Jersey in 1925 indicated that the larvae of *Popillia japonica*, Newm. (Japanese beetle) are not likely to be materially affected by the spring flooding in the cranberry bogs. Larvae submerged in bog water during May, at the end of which month flooding of the bogs for the control of certain insects is usually carried out for periods rarely exceeding 48 hours, were able to survive for from 10 to 14 days. A further experiment showed that the larvae of *P. japonica* are unable to survive the winter under bogs flooded for a period of four months during winter and spring.

Hutson (R.). **Bee Investigations.**—*Rep. New Jersey Agric. Expt. Sta. 1925–26*, pp. 229–237, 10 refs. New Brunswick, N.J., 1927.

In addition to the continuation of studies in pollination and the testing of strains resistant to European foulbrood, tests were made in 1925–26 of the efficiency of a mixture of ethyl acetate and carbon tetrachloride for fumigation against *Galleria mellonella*, L. (wax moth) [*R.A.E.*, A, xv, 293].

Snyder (T. E.). **Defects in Timber caused by Insects.**—*Bull. U.S. Dept. Agric.*, no. 1490, 46 pp., 45 figs., 51 refs. Washington, D.C., July 1927.

Wood-boring insects cause serious defects in timber by rendering the material unfit for use or by reducing it to lower grade. This loss is very difficult to estimate, but much of it can be prevented by slight changes or modifications in the present methods of handling the timber. In this bulletin, the principal types of defects, their causes, and, where possible, the remedial measures recommended for them, are dealt with. Certain types of damage that are not preventable are also discussed. It is estimated that the annual loss in timber value due to wood-boring insects in the United States is about £9,000,000, and that much of this loss can be prevented in the future in view of the present knowledge of the subject. Timber inspectors and graders should be able to determine from a defect in wood whether it was caused by insects working in the living tree, the freshly felled, green saw log or bolt, with or without its bark, the green, unseasoned lumber, or the rough or finished product. The rejection of timber with insect defects caused before the wood is dry or seasoned is often avoidable because the insects are no longer working in the wood, though such timber would probably be classed in a lower grade. On the other hand, the acceptance of material infested with powder-post beetles may result in a serious flaw in the completed article; the damage in this case is continued in the seasoned and finished product and may even spread to other hardwood stock stored in the vicinity.

The principal types of defects caused by insects are classified under the headings of pinholes, grub holes and powder-post, and the details of such damage and its cause are given. Pinholes, which are small, round, and generally open holes, ranging from one-hundredth to one-fourth of an inch in diameter, are made in living trees by ambrosia beetles, such as *Corthylus columbianus*, Hopk., *Platypus compositus*, Say, *Xyleborus* spp. and *Monarthrum* spp., which attack chiefly oaks and poplars, and by *Melittomma sericeum*, Harr., in chestnut and red oak, *Eupsalis minuta*, Drury, in oak, and *Strongylium* spp. in various hardwoods ; similar holes, which are usually less than one-eighth of an inch in diameter and open, are caused in the sapwood or heartwood of felled trees by *C. columbianus*, *Gnathotrichus* sp., *Xyloterus* sp., *M. sericeum*, *E. minuta* and *Hylecoetus lugubris*, Say, which oviposits in dying trees and green saw logs lying in woods with the bark on from April to July. Pinholes made in living trees are not preventable in ordinary forest practice, though the losses can be lessened by clean forest management, but those made in felled timber are preventable by prompt handling and rapid utilisation of the timber. Green logs or bolts, either with or without the bark, should be placed in the mill pond as soon as possible after being cut, especially during the warm months or in damp weather, and floated in loose booms so that they can be turned over, and the logs should be sawn up as soon as possible. Alternative methods are sun drying of the logs, and girdling followed by peeling and cutting, leaving the tops on for a time after cutting. Damage can be largely prevented by barking the logs, or by coating or spraying with a preservative, and repellent, poisonous or sticky chemical sprays should be used to prevent attack by ambrosia beetles on the more valuable species and products while the bark is on the logs and the wood will not be discoloured. Further remedies for various types of timber are recommended. There is some danger of introducing destructive species through the commercial interchange of timber in the form of logs, in which pinhole borers may live for a year or more and may attack native timber.

Grub holes, found in both sapwood and hardwood of all kinds of timber, are from $\frac{3}{8}$ in. to 1 in. in diameter, and may be made in the living tree, in the saw log or in piled green lumber. Such damage may be done by the termite, *Coptotermes niger*, Snyder, by *Xylocopa* sp. (carpenter bee) or *Camponotus* sp. (carpenter ant) or by the larvae of Siricids, such as *Tremex columba*, L., or *Sirex* (*Urocerus*) *albicornis*, F., but is more generally the work of young borers, sawyers or grubs. In living trees, where again the loss is not preventable, *Prionoxystus robiniae*, Peck (carpenter worm) is found chiefly in oak, chestnut, locust and cherry ; the Cerambycids, *Goes* spp., and *Romaleum* sp., in oak, and the former in hickory ; *Cossula magnifica*, Bailey, in hickory ; *Glycobius speciosus*, Say, in hard maple ; *Parandra brunnea*, F., in the butt logs of gum and a few other hardwoods ; *Buprestis apricans*, Hb., in butt logs of softwoods, chiefly pine ; *Serropalpus barbatus*, Schall., in softwood logs and lumber and in recently felled trees, These grub-hole injuries are unavoidable, but a number of other borers do similar damage after the trees have been felled, working in the sapwood of both hardwoods and softwoods. Such borers are *Monochamus* spp., which sometimes cause losses amounting to 35 per cent. in pines, spruces and firs; *Neoclytus capraea*, Say, and *N. erythrocephalus*, F. (red-headed ash borers) in ash and in hickory, which is also attacked by *Cyllene pictus*, Drury ; *C. robiniae*, Forst., in locust ; *Callidium antennatum*, Newm. (round-headed borer) in cedar ; and *Trachykele* spp. (flat-headed borers) in cypress, western redwoods and cedars. These injuries can be prevented by prompt handling of the logs after felling. Logs, bolts and sawn or squared timbers should never be allowed to lie in the woods after 1st February in the Gulf States or after 1st April further north, and treatment as for pinhole borers is recommended. Both the outer and inner bark of sawn timber should always be carefully removed and the timbers placed where they will season rapidly.

Powder-post damage is indicated by holes from one-sixteenth to one-fourth of an inch in diameter in the sapwood and heartwood of both hardwoods and softwoods, from which the powder will fall when shaken. All powder-post damage is preventable. Much of it is caused by species of *Lyctus* [*R.A.E.*, A, v, 434], and in seasoned hardwood products it sometimes amounts to a loss of from 10 to 50 per cent., the loss increasing with the length of time the infested stock is kept in store. The total loss in the United States from these beetles is estimated at hundreds of thousands of dollars. Damage can be prevented largely by proper methods of classification and the piling of stock by kinds, by keeping heartwood and sapwood stock separate, by periodical inspection, utilising the old stock first, and by using only heartwood piling sticks. Submergence of the wood in water for 4 months renders it immune from attack. Finished wood products may be treated with creosote as a repellent, but this stains the wood. Since eggs are laid in the pores of the wood, any substance that will close the pores will prevent oviposition ; paraffin wax, varnish, linseed oil etc. may be used for this purpose. Preventives should be applied before 1st March, and only sapwood that has been seasoned for 8 to 10 months or longer need be treated. Remedies that have proved effective include kiln-drying at high temperatures [*R.A.E.*, A, xiii, 45], steaming at 130° F. (which, however, does not insure against future attack) and treatment with orthodichlorobenzene or a mixture of kerosene and coal tar creosote. Similar damage is caused by *Xyletinus peltatus*, Harr., and by other Anobiids and Ptinids, these species also attacking the heartwood of softwoods, and by Bostrychids such as *Xylobiops basilare*, Say, *Bostrychopsis parallela*, and *Scobicia* spp., which attack freshly felled logs with the bark on ; by Cerambycids, such as *Smodicum cucujiforme*, Say (flat powder-post beetle) and *N. capraea*, and *Hylotrupes bajulus*, L., which attacks only well seasoned wood that has been stored for more than a year, but continues to work for years until the wood is thoroughly perforated ; and by Buprestids, such as *Trachykele* spp., which attack western redwoods and cedars, whether living, dying or dead. To prevent this injury, the forest should be kept clear of dead and dying trees, and felling and girdling should be practised from October to December, while the sap is not actively flowing.

Minor injuries are caused by *Tortrix* (*Cacoecia*) *fumiferana*, Clem. (bud worm) and by *Recurvaria milleri*, Busck (needle miner), which produce ring distortion as a result of defoliation of spruce and fir, the latter also attacking pines ; *Dendroctonus* spp., *Pinipestis zimmermanni*, Grote, and the pitch moths, *Aegeria* (*Sesia*) *novaroensis*, Edw., and *Vespamima sequoia*, Edw., are the cause of pitch streaks in pines and Douglas fir [*Pseudotsuga taxifolia*] ; *Melanophila drummondi*, Kirby, *P. zimmermanni* and *D. pseudotsugae*, Hopk., cause gum spots or streaks in western hemlock and Douglas fir, the last-named being responsible for 70 per cent. of this damage ; the larvae of *Cheilosia* spp. and of *Parharmonia*, and of the beetles, *Romaleum* sp. and *Goes* sp. cause dark stains in the heartwood and sapwood of softwood trees, particularly western hemlock ; *Dendroctonus* spp. and ambrosia beetles, such as species of *Gnathotrichus*, *Xyleborus* and *Platypus*, produce bluish-black streaks or stains in the sapwood of pines and certain hardwoods, the stains being caused by fungi, the spores of which are carried by the insects ; *Agromyza* spp. and *Pissodes dubius*, Rand, are the cause of pith flecks in certain hardwoods.

Miller (J. M.) & Patterson (J. E.). U.S. Bur. Ent. **Preliminary Studies on the Relation of Fire Injury to Bark-beetle Attack in Western Yellow Pine.**—*J. Agric. Res.*, xxxiv, no. 7, pp. 597–613, 7 figs., 1 ref. Washington, D.C., 1st April 1927.

Studies of the effect of fire in pine forests of the Pacific slope region of California and Oregon carried out from 1917 to 1920 showed that the western yellow pine (*Pinus ponderosa*) is rendered particularly attractive to *Dendroctonus brevicomis*, Lec., by fires of sufficient severity to scorch the bark, cambium and foliage ; many trees that have been only moderately injured by the fire, and are apparently capable of recovering, are attacked and killed by the beetles. A concentration of beetles, sometimes extending to a radius of 2 or 3 miles from the burned area and lasting one or two seasons following the fire, is often caused by fire-injured trees, without, however, developing into an epidemic. The loss from bark-beetle attacks in trees not injured by the fire, either within the burned area or in the surrounding forest, is not materially increased by such concentrations. Fires that are not severe enough to burn the bark from infested trees are of little value in controlling infestations, the broods in 5 out of 6 trees under observation after burning continuing to develop and the emergence from them in the following spring being normal. In the remaining trees broods in the larval and pupal stage were killed on one side of the trunk where the heat had been severe. High mortality was observed in 1918 among *D. brevicomis* in fire-scorched trees, in which the sudden cutting off of the respiratory functions due to defoliation had apparently caused an excessively moist condition of the inner bark. An analysis made by counting entrance and exit holes of the beetles on representative pieces of bark indicated that though fire-injured trees attract the beetles in considerable numbers, they at the same time afford a very unfavourable breeding ground for them and eventually contribute toward an actual reduction in their numbers. A comparison between normal and fire-injured trees showed that the excess of emergence over attack in the former was about 320 per cent. in 1918, while the scorched trees showed an actual decrease of about 8 per cent. It appears from these studies that fires neither reduce losses from bark-beetles by killing them (unless they are severe enough to kill the trees also) nor permanently increase bark-beetle losses in surrounding timber. The bark-beetles do, however, cause added destruction to fire-injured trees that would otherwise have survived.

Holland (E. B.), Dunbar (C. O.) & Gilligan (G. M.). **Influence of Form and Proportion of Lime used and Method of Mixing on the resulting Bordeaux Mixture.**—*J. Agric. Res.*, xxxiv, no. 7, pp. 677–686, 20 refs. Washington, D.C., 1st April 1927.

The following is mainly taken from the authors' summary : Four forms of lime (limewater, chemically precipitated lime, milk of lime and commercial hydrated lime) were employed in preparing Bordeaux and allied mixtures. The activity varies directly as the degree of dispersion and decreases in the order in which the forms of lime are named.

The best ratios of active lime in the several forms to coppersulphate and water, as judged by suspension, are limewater, 0·538 gm. : 0·109 gm. : 100 cc. ; precipitated lime, 4 lb. : 1·50 lb. : 50 U.S. gals. ; milk of lime 4 lb. : 2 or 2·25 lb. : 50 U.S. gals. ; and hydrated lime, 4 lb. : 2 lb. : 50 U.S. gals. By active lime is meant that portion which can be readily determined by titration against standard acid to the initial disappearance of colour, using thymophthalein as indicator, thereby excluding coarse particles that are slow to react.

The best method of mixing, similarly judged, is by pouring dilute copper sulphate into concentrated lime, or the two simultaneously into a third receptacle. Some of the better grades of hydrated lime are promising substitutes for milk of lime, but require soaking before being used

CUSHMAN (R. A.). U.S. Bur. Ent. **The Parasites of the Pine Tip Moth,** *Rhyacionia frustrana* (**Comstock**).—*J. Agric. Res.*, xxxiv, no. 7, pp. 615–622, 1 fig., 2 refs. Washington, D.C., 1st April 1927.

Studies were made in 1924 and 1925 of the parasites of *Rhyacionia frustrana*, Comst., in Virginia, where it attacks *Pinus virginiana*, with a view to introducing them into Nebraska to control *R. frustrana bushnelli*, Busck, which has recently caused serious damage to western yellow pine [*Pinus ponderosa*] in that State. Twenty-one species of parasitic Hymenoptera and two Tachinids were bred during these studies ; notes on these and on several other species bred from *R. frustrana* in Louisiana and Massachusetts and a key for their determination are given. *Goniozus longiceps*, Kieff., *Epiurus indagator*, Cress., *Calliephialtes comstocki*, Cress., *Microbracon mellitor*, Say, *M. gemmaecola*, Cush., *M. gelechiae*, Ashm., *Eurytoma tylodermatis*, Ashm., *Secodella subopaca*, Gah., *Hyssopus thymus*, Gir., *H. rhyacioniae*, Gah., *Elachertus pini*, Gah., and *Habrocytus thyridopterigis*, How., are external parasites of the larva. *Campoplex frustranae*, Cush., *Cremastus epagoges*, Cush., *Glypta varipes*, Cress., *Phanerotoma rhyacioniae*, Cush., *Apanteles* sp., and the Tachinids *Lixophaga mediocris*, Aldr., and *L. plumbea*, Aldr., are internal parasites of the larva ; *Pimpla* (*Itoplectis*) *conquisitor*, Say, and *Haltichella rhyacioniae*, Gah., are parasites of the pupa. *Spilochalcis* sp. and *S. delira*, Cress., are hyperparasites, attacking pupal parasites. Several other parasites are included, but their status is unknown, and they are probably not primary parasites of *R. frustrana*.

GRAHAM (S. A.) & BAUMHOFER (L. G.). U.S. Bur. Ent. **The Pine Tip Moth in Nebraska National Forest.**—*J. Agric. Res.*, xxxv, no. 4, pp. 323–333, 3 figs., 1 ref. Washington, D.C., 15th August 1927.

The pine tip moth, *Rhyacionia frustrana bushnelli*, Busck, is a severe pest of pines in Nebraska, especially of western yellow pine (*Pinus ponderosa*), the species most suited to the sandhills of this region. The distribution and life-history of the moth are described [*cf. R.A.E.*, A, xv, 405, where the abstract erroneously records the insect concerned as *R. buoliana*, Schiff.]. Pines are most susceptible to attack after growing above the surrounding grass and until they are

8–9 ft. high. The emergence of moths from hibernation lasts for several weeks, beginning as a rule early in April; eggs are laid soon after emergence during the night or early evening, and as many as 65 have been laid by one individual in the laboratory. In the spring of 1925 oviposition had been in operation for 40 days before the first larva was found; under laboratory conditions, however, hatching occurred in 10–14 days, while in the summer it took place in 6–10 days, indicating that the period is shorter in the second generation. Larvae of the first generation are present between the middle of May and early June; they pupate in the tips or buds in which they have tunnelled; in the laboratory the moths emerged in 14–19 days and were present in the forest for less than a month from the latter part of June. Oviposition apparently occurred soon after emergence, the larvae of the second generation having been observed throughout the greater part of July and August and pupating about 10th–15th August in the litter under the trees or just beneath the surface of the sand. In hibernating in the pupal stage in the soil *R. frustrana bushnelli* differs from *R. frustrana*, Comst., which hibernates in the pupal stage within the injured tips in the eastern United States.

Although it is possible that this moth has been introduced into Nebraska without its most effective natural enemies, 16 species of parasites have been reared from the larvae, a list of them being given. The most numerous are the Chalcids, *Eurytoma tylodermatis*, Ashm., and *Haltichella* [*rhyacioniae*, Gah.], while there is at least one undetermined Chalcid egg parasite. The percentage of parasitism is considerably lower on *Pinus ponderosa* than on other species. It is possible that this is accounted for by the fact that the larger buds and twigs of this tree provide more effective shelter for the larvae so that they are not so easily reached by the smaller parasites. The Clerid, *Hydnocera pubescens*, Lec., and probably other predacious beetles prey upon this pest.

VAN DER MEULEN (P. A.) & VAN LEEUWEN (E. R.). U.S. Bur. Ent. **A Study of Lead Arsenate and Lime Spray Mixtures.**—*J. Agric. Res.*, xxxv, no. 4, pp. 313–321, 11 refs. Washington, D.C., 15th August 1927.

The following is the authors' summary of a paper dealing with the results obtained in laboratory studies of the chemical action that may occur in mixtures of acid lead arsenate and lime, and with the effectiveness of the mixture in preventing the arsenical injury in spraying peach orchards:—

The action of a solution of calcium hydroxide on acid lead arsenate has been studied in the laboratory. Under the conditions of the experiments, long-continued action of an excess of calcium hydroxide on acid lead arsenate resulted in decomposition of the lead arsenate with the formation of basic calcium arsenate and a hydrate of lead oxide; the reaction takes place slowly, and, under the conditions usually met with in spraying operations, probably less than 1 per cent. of the acid lead arsenate is decomposed. The action of the carbon dioxide of the air on the mixture of calcium hydroxide and lead arsenate does not produce an appreciable increase in "soluble arsenic" until after the lime has been carbonated; thereafter the amount of "soluble arsenic" increases very materially; in the particular case studied, the increase was from 0·65 per cent. to 3·15 per cent. of As_2O_5. Orchard experiments with lead arsenate, with and without the addition of slaked lime, have been conducted during the seasons of 1923 to 1926, inclusive, at Riverton, N.J. It is definitely shown that slaked lime added to lead arsenate prevents peach foliage injury by "soluble arsenic." In one series of experiments, in which a lime high in magnesia was used, no injury resulted. There is a practical advantage in combining 3 lb. slaked lime with 1½ lb. acid lead arsenate in 50 U.S. gals. water.

Frost (S. W.). **Notes on the Life History of the Bud Moth,** *Spilonota ocellana* **D. & S.**—*J. Agric. Res.*, xxxv, no. 4, pp. 347–359, 2 pls., 2 figs., 4 refs. Washington, D.C., August 1927.

Investigations into the life-history and habits of *Eucosma* (*Spilonota*) *ocellana*, Schiff. (eye-spotted bud moth) in Pennsylvania were made in an outdoor insectary and in neighbouring orchards. The immature stages are described. In 1919 the moths emerged in early June, and eggs were laid several days later; the adults are rarely observed flying in the orchards and are, as a rule, not attracted to lights or sugar baits. In all cases oviposition occurred at night, the maximum number of eggs laid by one individual being 450 in 1919; they are laid singly or in overlapping patches of from 2 to 20 and fastened to the upper side of the leaves with a viscous material that hardens on exposure to the air. The larvae hatch in 7–12 days and begin to spin their feeding cases by webbing the leaves together; they then construct a silken tube within this on the underside of the leaves along the midrib and larger veins, and begin feeding in 2 days; the tube is lengthened as feeding proceeds. The larvae are shallow feeders on both foliage and fruit, making holes in the lower epidermis and parenchyma as far as the upper epidermis. A considerable amount of plant tissue is consumed by the larvae, as they do not eat a single area, but nibble a little here and there; they also bite into the fruit, especially where a leaf is in contact with the fruit, or two fruits hang together. This is the most serious form of injury occurring in Pennsylvania. From mid-summer to late autumn the feeding habits of the larvae are irregular, most of them becoming quiescent. Some of these, however, start feeding again and pupate in August, producing a partial second generation; it would, however, appear from several years of observation, that the one generation a year is the rule. The larvae of the 8th, 9th, or 10th instars normally hibernate in silken cases on the twigs near the buds; in confinement some burrowed into the cork stoppers of the rearing bottles while others formed no hibernacula at all; there is a very high mortality among larvae in the breeding cages. The hibernating larvae emerge early in spring, becoming mature toward the end of May and pupating in the curled leaves; they feed on the newly opening buds and foliage, tying the leaves together as they unfold and chewing the immature apples frequently enclosed in these clusters.

Brannon (C. H.). **Life-history of the Plum Curculio** (*Conotrachelus nenuphar*, **Herbst**).—*J. Elisha Mitchell Sci. Soc.*, xliii, no. 1–2, pp. 79–83, 1 pl., 1 ref. Chapel Hill, N.C., December 1927.

In Georgia, where it is the most destructive pest of peach, *Conotrachelus nenuphar*, Hbst. (plum curculio) has two generations a year.

The beetles hibernate and lay their eggs mostly in the young fruit at the end of March and beginning of April. The larvae hatching from these eggs feed in the fruit and pupate in the soil producing adults that lay their eggs in the ripening fruit. The adults resulting from these eggs hibernate. The largest number of eggs obtained from a female in captivity was 218, oviposition extending over 5 months. Plums are preferred to other fruit for oviposition, and were used in experiments as long as they were available, peaches being used subsequently. Of 100 beetles collected in March 1921, 12 went into hibernation for a second time in the following October, but failed to survive the winter. The life-history of the weevil in North Carolina is essentially the same as in Georgia.

PAPERS NOTICED BY TITLE ONLY.

TAKAHASHI (R.). **A new Species of Aphididae from Formosa and three Species new to China.**—*Trans. Nat. Hist. Soc. Formosa*, xvii, no. 93, pp. 388–390. Taihoku, December 1927.

BOUVIER (E. L.). **Sur le papillon séricigène de l'ailanthe** [*Attacus* (*Philosamia*) *cynthia*, **Dru.**] **et les formes affines.**—*C.R. Acad. Agric. Fr.*, xiii, no. 29, pp. 919–935, 6 refs. Paris, 1927.

SAUNDERS (A. R.) & WAHL (R. O.). **The Effect of Carbon Bisulphide on the Germination of Maize.**—*Bull. Dept. Agric. S. Afr.*, no. 28, 4 pp., 1 fig., 1 ref. [Pretoria] June 1927. [See *R.A.E.*, A, xv, 328.]

KNOWLTON (G. F.). **A few** *Capitophorus* **Species of Utah with Descriptions of two new Species (Aphididae).**—*Canad. Ent.*, lix, no. 10, pp. 235–238, 3 figs. Orillia, Ont., October 1927.

KAUTZ (H.). *Pieris napi*, **L.** [The seasonal and geographical Variations of *P. napi* and *P. napi* var. *bryoniae.*]—*Verh. zool.-bot. Ges. Wien.*, lxxvii, no. 3, pp. 44–79. Vienna, 25th September 1927.

[IVANOVA-BERG (M. M.).] **Иванова-Берг (M. M.). Bibliography of Literature on the Animal Kingdom of Turkestan.** [Agricultural Pests pp. 110–115, 196–197. Locusts pp. 115–124, 197.] [*In Russian.*]—iv+235 pp. Leningrad, Acad. Sci. U.S.S.R., 1927. Price 7*r.* 50*k.*

GÓMEZ MENOR (J.). **Algunos cóccidos nuevos de España (Hem. Cocc.).** [Some new Coccids from Spain.]—*Eos*, iii, no. 3, pp. 289–298, 5 figs. Madrid, 15th November 1927.

JANSSON (A.). **Coleopterologiska bidrag. 17. Till kännedomen om de svenska barkborrarnas utbredning.** [Coleopterological Contribution 17. To the Knowledge of the Distribution of Bark-beetles in Sweden.]—*Ent. Tidskr.*, xlviii, no. 4, pp. 225–226. Stockholm, 1927.

HOKE (G.). **Some undescribed Diaspines from Mississippi. (Homoptera: Coccidae.)**—*Ann. Ent. Soc. Amer.*, xx, no. 3, pp. 349–358, 2 pls. Columbus, Ohio, September 1927.

WILCOX (J.) & MOTE (D. C.). **Observations on the Life History, Habits and Control of the Narcissus Bulb Fly,** *Merodon equestris* **Fab., in Oregon.**—*J. Econ. Ent.*, xx, no. 5, pp. 708–714, 1 pl. Geneva, N.Y., October 1927. [See *R.A.E.*, A, xvi, 107.]

TAYLOR (R. L.). **A new Species of Parasitic Hymenoptera (Chalcidoidea, Eupelmidae).**—*Bull. Brooklyn Ent. Soc.*, xxii, no. 4, pp. 205–207, 1 fig. Brooklyn, N.Y., October 1927.

Eupelmus pini, sp. n., was reared during October 1926 from cocoons in the larval chambers of *Pissodes strobi*, Peck (white pine weevil) in the terminal shoots of white pine in Massachusetts ; it is not known whether it is a primary parasite of the weevil.

CLAUSEN (C. P.). **The Citrus Insects of Japan.**—*Tech. Bull. U. S. Dept. Agric.*, no. 15, 15 pp., 5 figs., 8 refs. Washington, D.C., October 1927.

This review of insects attacking *Citrus* in Japan is designed to place within the reach of American entomologists and fruit growers information published in Japan in regard to these pests in view of the possibility of their becoming a menace to *Citrus* in the United States. A history is given of *Citrus* culture in Japan, where it has been carried on for at least 13 centuries, though production on a large scale for commercial purposes is comparatively recent. Many introduced insects have thus reached the status of native pests restricted by natural control.

Most of the *Citrus* insects of major importance in Japan are Coccids, none of them being present as a pest in California ; of these *Chionaspis* (*Prontaspis*) *yanonensis*, Kuw., is the most injurious, others being *Ceroplastes rubens*, Mask. (red wax scale), *Pulvinaria aurantii*, Ckll., *Parlatoria pergandei*, Comst. (chaff scale), *Pinnaspis* (*Hemichionaspis*) *aspidistrae*, Sign., *Lepidosaphes gloveri*, Pack., and the whiteflies, *Aleurocanthus spiniferus*, Q. & B., and *Aleurolobus marlatti*, Quaint.

A further list of Coccids and Aleurodids that are relatively unimportant in Japan includes all but one of the injurious species of California and most of those of Florida, the climate of which more closely resembles that of Japan. *Pseudococcus kraunhiae*, Kuw., is not known to occur in Japan, though it was observed in considerable numbers by the author in southern China in 1916.

Pests attacking the fruit include the Noctuids, *Othreis* (*Ophideres*) *tyrannus*, Guen., *Calpe excavata*, Butl., and *C. capucina*, Esp., the larvae of which feed upon plants other than *Citrus*, the larvae of *O. tyrannus* being found only upon *Akebia quinata* ; the Pyralid, *Dichocrocis punctiferalis*, Guen., and two Tortricids, the more common of which is *Tortrix* (*Cacoecia*) *podana*, Scop., which bore into the fruit in the larval stages. Only one species of orange fruit-fly, *Dacus tsuneonis*, Miyake, has been found thus far in Japan [*R.A.E.*, A, vii, 238]. The leaves are attacked by *Phyllocnistis saligna*, Zell. (citrus leaf-miner), which causes extensive injury, *Depressaria culcitella*, H.S., and several species of the genus *Papilio*, the most important of which is *P. xanthus*, L.

Other minor pests include a Fulgorid, *Geisha distinctissima*, Wlk., which feeds on the newly developed leaves, *Phyllocoptes* (*Eriophyes*) *oleivorus*, Ashm. (orange rust mite), and a Cetoniid beetle, *Oxycetonia jucunda*, Falderm., which feeds on the blossoms and sometimes prevents the proper setting of the fruit.

The small size and situation of the groves in Japan renders spraying and fumigation on a large scale, such as is practised in California, economically and physically impossible, and no co-operative organisations exist there. *Pulvinaria aurantii* is generally controlled by the use of kerosene emulsion, but in the majority of cases no attempt is made to control insect pests. The survey shows that there are pests of *Citrus* in the East that have not yet been introduced into the United States, where they might prove to be dangerous.

WEIGEL (C. A.), YOUNG (H. D.) & SWENSON (R. L.). **An Apparatus for the Rapid Vaporization of Carbon Disulphide.**—*Circ. U.S. Dept. Agric.*, no. 7, 8 pp., 4 figs. Washington, D.C., November 1927.

Since it is now compulsory to fumigate all narcissus bulbs infested with either *Merodon equestris*, F. (narcissus bulb fly) or *Eumerus strigatus*, Fall. (lesser bulb fly) with carbon bisulphide at the rate of 25–30 lb. per 1,000 cu. ft. under a 27 inch vacuum for a period of 1¾–2 hours, experiments have been carried out to find a practical and simple method by which bulbs can be treated under field and storage conditions.

An apparatus is described in which carbon bisulphide is vaporised in a shallow copper pan. A coil of seamless copper tubing is run through the pan and heated by a flow of water, which may be raised to 84° C. [183° F.] without fear of igniting the carbon bisulphide, allowing a margin of safety of 12° C. [21° F.]. This apparatus may be connected directly with a hot water system if one is available, or if set up in the field, may be connected to a small tank, to serve as a reservoir for the hot water. To vaporise 10 lb. carbon bisulphide (9 lb. may be considered to be a normal quantity for fumigation purposes), 4 U.S. gals. water should be run through the coil, having an initial temperature of not less than 75° C. [167° F.] and an outlet temperature of not more than 50° C. [122° F.]. For practical purposes the rate of evaporation varies directly as the area of the coil surface, provided that sufficient hot water is run through to heat the whole coil; by doubling the coil surface the length of time needed to vaporise a given dosage may be halved.

JARVIS (E.). **Weevil Borer of Cane. How to breed the Tachinid Parasite of the Weevil Borer of Sugar-cane.**—*Trop. Agriculture*, iv, no. 11, pp. 203–205, 2 pls. Trinidad, November 1927.

The type of cage and the methods used in rearing, transmitting and liberating *Ceromasia sphenophori*, Vill., the Tachinid parasite of the weevil borer of sugar-cane [*Rhabdocnemis obscura*, Boisd.] are described. The cage should be large enough to allow ample room for the artificial establishment of environmental conditions conducive to the breeding of the parasitic fly; the one constructed for the present work had a capacity of about 400 cubic feet. The cage should be placed in a secluded position, free during most of the day from excessive heat, bright light or drying winds. Borer grubs to serve as hosts should be cut out of badly infested cane sticks from the nearest plantation. Some basal pieces of cane with the roots removed should be washed and holes made at the centre of each internode with a punch; into these the borer grubs are introduced head first. They disappear at once, and a wad of the interlaced woody fibre used for constructing the cocoon should then be placed over the holes in such a manner that the parasitic larvae can crawl through to reach their host. These artificially-infested sticks should be planted in batches of 12 to 15 in small tins of soil, and in other tins are planted young banana suckers from 1 to 2 ft. high, or other suitable plants with broad, drooping leaves. These should be watered twice a day, or three times in extremely hot weather, by throwing half a pint of water over them through the top of the cage. The flies should be fed once a day at 8 a.m., and for this purpose a few lengths of cane should be split in half lengthwise and laid cut-side-up on the soil of the tins ; they should be renewed each morning. When sticks are transferred from a breeding-cage for establishment in borer-infested cane-fields, those that have been from 25 days to a month in a cage containing from 25 to 40 flies should be chosen, as these will doubtless harbour numerous puparia from which the parasites should emerge about a week later.

The chief insect enemy of *C. sphenophori* is the small brown ant, *Pheidole megacephala*. To prevent its attacks, the legs of the cage should be stood in water, and, should an invasion occur, any tins of sticks infested should be removed at once and the canes re-planted in clean soil. The flooring and ground-plates should be scalded with boiling water if necessary. Flies that have died from attacks of the fungus, *Empusa* sp., should be removed from the sides of the cage and the spot dabbed with a solution of 20 per cent. formalin or other strong fungicide.

For liberation, about an equal number (say 10 to 15) of each sex of the Tachinid should be captured in glass test-tubes about 7 in. long by 1½ in. in diameter, which should be well washed inside and carefully dried before use. If the mouth of the tube be gently placed over them, they will fly into it and settle on the side ; eight or ten can be caught in one tube which should then be closed with a wad of cotton wool rung out in clean tap water. Daybreak after a cool night is the best time for catching the flies. A thin wafer of cane, one end of which is held in place by the cotton wool which presses it firmly against the side of the glass, should be put in each tube for feeding the flies during transit. The parasites will travel well for 2 or 3 days, but should be kept as cool as possible, and occasionally the tubes should be ventilated by removing the wad and replacing it for a few minutes with a perforated zinc cap which should be turned to face the wind. The parasites should be liberated, just after sunrise, in the midst of badly-infested cane sticks and near the windward side of a plantation, first sprinkling a few of the cane stools with rain water. A box suitable for use when it is desired to establish puparia of the parasite in the canefields is described.

THEOBALD (F. V.). **Capsid Bugs (Capsidae) on Fruit Trees and Bushes.** —*Bull. S.E. Agric. Coll.*, no. 6, 8 pp., 4 figs. Wye, Kent, October 1927.

The bulk of this information has already been noticed [*R.A.E.*, A, xv, 581]. In connection with the importance of preventing Capsid nymphs, dislodged but not killed by spraying, from reascending the trees, either by the use of adhesive bands or by spraying them on the ground, it is mentioned that the latter method has given good results against *Calocoris fulvomaculatus*, DeG. (needle-nosed hop bug), which was only partly controlled by spraying the hop bine alone. The nicotine spray may be improved by increasing the soap to 6 lb.

Theobald (F. V.). **Entomological Department.**—*Ann. Rep. Res. & Adv. Dept.* [*S.E. Agric. Coll.*] *1926–27*, reprint, 16 pp., 21 refs. [Wye, Kent, 1927.]

Pests of fruit reported during the year ending 30th September 1927 included: *Pterostichus vulgaris*, L., on strawberries; *Melolontha melolontha*, L. (*vulgaris*, F.), on the roots of strawberries and apple trees; *Rhynchites coeruleus*, DeG., and *Taeniocampa incerta*, Hfn., on apple; *Coleophora nigricella*, Steph., on plum and apple; *C. anatipenella*, Hb., on cherry; *Taeniothrips* (*Euthrips*) *pyri*, Daniel, on plum; and *Psylla pyricola*, Först., on pears. Aphids on fruit, which were less abundant than usual, included *Amphorophora cosmopolitana*, Mason, on black currants, *Anuraphis amygdali*, Buckt., on peach, and *Amphorophora fragariella*, Theo., and *Capitophorus fragariae*, Theo., on strawberry. The parasite, *Aphelinus mali*, Hald., does not appear to be of any value against *Eriosoma lanigerum*, Hausm., in two districts in Kent in which it has been released.

Pests of hops included *Gortyna* (*Hydroecia*) *micacea*, Esp., the larvae of which tunnelled up the bines, *Acronycta rumicis*, L. (dock moth) and a bug, *Oncotylus viridiflavus*, Goeze. Stored hops were infested by *Ptinus tectus*, Boield.

The most important pest of vegetables was *Kakothrips pisivorus*, Westw. (*robustus*, Uzel), which did much damage to both field and garden peas in many parts of south-eastern England. Potatoes were attacked by *Trama* (*Protrama*) *radicis*, Kalt., and cucumbers under glass by the Myriapod, *Paradesmus gracilis*, L. Mint was attacked in several cases by the larvae of *Hepialus lupulinus*, L. *Sciara praecox*, Meig., which caused serious loss in mushroom houses, was successfully controlled by fumigation with hydrocyanic gas.

Otiorrhynchus sulcatus, F., was found attacking the roots of *Fuchsia*, and the larvae of *Gortyna ochracea*, Hb., destroyed *Delphinium* and *Digitalis*. *Myzus duffieldi*, Theo., *M. circumflexus*, Buckt., *M. persicae*, Sulz., and *Macrosiphum gei*, Theo., attacked tulips; *M. gei* also destroyed the flowers of *Fuchsia*. Bay trees imported from Belgium were found to be infested with *Saissetia* (*Lecanium*) *hemisphaerica*, Targ. (brown scale).

An account is given of the year's crop of *Pyrethrum*, indicating that while the Japanese plants are dying, the French have done well. Experiments with pyrethrum wash show that although it is as good as nicotine against Aphids, it failed completely against the larvae of Lepidoptera and of sawflies, particularly those of *Pieris brassicae*, L. All trials against *Hyponomeuta padellus*, L., and *H. euonymellus*, L., however, gave a very high degree of control.

The examination of a number of weeds in the course of Aphid investigations resulted in the discovery of *Anuraphis ranunculi*, Kalt., on the roots of docks (*Rumex*), plantains (*Plantago*) and buttercups (*Ranunculus*), and *A. subterraneus*, Wlk., in great abundance on wild parsnip roots. *Tetraneura ulmifoliae*, DeG., was found on wheat roots as well as on the roots of many grasses.

Morris (H. M.). **The Insect and other Invertebrate Fauna of Arable Land at Rothamsted. Part ii.**—*Ann. Appl. Biol.*, xiv, no. 4, pp. 442–464, 3 figs., 10 refs. Cambridge, November 1927.

In this further study of the insect fauna of arable land [*R.A.E.*, A, xi, 72], the effect of adding dung and certain artificial manures to the soil has been observed. From the results, which have been carefully tabulated, it appears that artificial manures have but little effect on the soil fauna, but that the use of dung increases the insects both in numbers and species very considerably.

WALTON (C. L.). **Note on the Activities of Humble Bees** (*Bombus*) **in North Wales.**—*Ann. Appl. Biol.*, xiv, no. 4, pp. 465–469, 3 refs. Cambridge, November 1927.

An account is given of the species of *Bombus* observed in North Wales during 1919–27, with notes on their abundance and seasonal history and the plants of economic importance visited and preferred by them.

The Biology of Thysanoptera with reference to the Cotton Plant.

WARDLE (R. A.). **1. The Relation between Degree of Infestation and Water supplied,** pp. 482–500, 3 figs., 12 refs.

MACGILL (E. I.). **2. The Relation between Temperature and Life Cycle in a Saturated Atmosphere,** pp. 501–512, 3 figs., 6 refs.

WARDLE (R. A.) & SIMPSON (R.). **3. The Relation between Feeding Habits and Plant Lesions.**—*Ann. Appl. Biol.*, xiv, no. 4, pp. 513–528, 8 figs., 13 refs. Cambridge, November 1927.

Experiments with *Thrips tabaci*, Lind., on cotton plants in greenhouses suggest that the infestation factor, or number of thrips (larvae and adults) per 100 sq. cm. of foliage surface varies inversely with the weight of water supplied. Irrigation is more effective than rainfall in influencing the degree of infestation, and on a flat soil surface is more effective than on a furrowed one. Plants receiving an excessive water supply have a lower infestation factor and fewer thrips per leaf than those receiving sufficient water, while plants receiving insufficient water have a greater infestation factor than those receiving sufficient water but do not necessarily have a greater number of thrips to a leaf; owing, however, to their smaller foliage area they suffer more from attacks by thrips. The low degree of infestation on plants with excessive water supply does not appear to be due to mechanical removals of thrips from the leaf, nor to any injurious effect of soil moisture or atmospheric moisture on thrips, nor to alteration of the osmotic concentration of cell sap, although each of these factors may operate slightly. A heavy water supply affects the texture of certain soils in promoting surface caking, and thus will act inimically on species of Thysanoptera that pupate in the soil.

The life-cycle of *T. tabaci* from egg to adult on cotton plants at temperatures between 26·7° C. [79° F.] and 11·25° C. [52° F.] and humidity between 92·4 and 74·7 per cent. occupies from 23 to 31 days, comprising 8 days for the egg, 10 to 14 for the larva, 1 or 2 for the prepupal and 4 to 7 for the pupal stages. Under laboratory conditions, in a constant saturated atmosphere, the percentage of larvae transforming into prepupae is not high at any temperature, but reaches its maximum (33·4 per cent.) at temperatures near 21° C. [69·8° F.], the minimum effective temperature being below 7° C. [44·6° F.] and the maximum above 38° C. [100·4° F.]. A similar high rate of mortality is believed to occur under field conditions. The percentage of prepupae and pupae that transform are high at all temperatures between the effective points and would probably be absolute under conditions of perfect technique. The length of the life-cycle is decreased by increase of temperature.

The injury to cotton plants by thrips is due entirely to premature and excessive defoliation. The injury consists essentially of necrosis of a patch of mesophyll cells lying immediately below a gash in an epidermal cell, and this, in later stages, spreads over the whole leaf, causing shedding ; there is no evidence that the salivary secretion of the insect is toxic. The preference shown by thrips for the lower surface of leaves is believed to be due to difference in thickness of the epidermis of the upper and lower surface rather than to negative phototropism. In such plants as cotton, where the differences are slight, thrips readily invade the upper leaf surface. On *Cajanus indicus* the upper surface is the more favoured, the lower surface being unsuitable owing to the close spacing of numerous fine hairs. The more widely spaced hairs on cotton leaves do not act as a deterrent, the hairy American and Indian varieties being more heavily attacked than the smoother leaved Egyptian ones.

MORRIS (H. M.). **The Treatment of Scale Disease on Citrus-trees.**—*Cyprus Agric. J.*, xxii, pt. 4, pp. 113–115. Nicosia, October 1927.

Chrysomphalus (*Aonidiella*) *aurantii*, Mask. (red scale) causes considerable damage to citrus fruit in Cyprus. A general account of the pest is given, fumigation with HCN being recommended for its control. Considerable success has been obtained with this method, the gas being generated under a tent which is left over the tree for about 45 minutes.

PUSSARD (R.). **Note sur l'emploi des vases poreux pour les élevages d'insectes.**—*Bull. Soc. Sci. nat. Rouen*, 1924, pp. 11–16, 5 refs. Rouen, October 1924. [Recd. 1927.]

This paper discusses the methods employed by other workers in studies of wireworms and describes the technique of the author's own experiments, in which a form of porous cylindrical earthenware pot was employed. The pots are sunk into the ground under a cage, and the earth sifted into them is kept at the same level and degree of humidity as the surrounding soil. This method makes it possible to obtain, under natural conditions, the complete larval development of wireworms, the exact duration of which has never been experimentally verified, and will be of value for the study of other soil-inhabiting insects.

REGNIER (R.). **Introduction à l'étude de l'Anthonome du pommier. Les Anthonomes au point de vue économique.**—*Bull. Soc. Sci. nat. Rouen*, 1924, pp. 16–19. Rouen, October 1924. [Recd. 1927.]

This general review of the genus *Anthonomus* from the point of view of its economic importance includes the following species among those found in France : *Anthonomus pomorum*, L., on apple, *A. cinctus*, Redt., on pear, *A. rubi*, Hbst., on strawberry, raspberry, blackberry and rose, all attacking the blossoms ; *A. spilotus*, Redt., on leaf-buds of pear ; and *A. rectirostris*, L., which sometimes attacks young stone fruit.

[SAKHAROV (N.) & STRUKOV (V.).] **Сахаров (Н.) и Струков (В.). The Study of the Nocturnal Insect Fauna, particularly of the Noctuidae.** [*In Russian.*]—*J. exptl. Landw. Südost. Eur.-Russ.*, iv, pt. 2, pp. 249–262, 1 fig. Saratov, 1927. (With a Summary in German.)

The light trap described consists of a large funnel suspended under a strong electric light, with a bottle containing methylated spirit and formalin attached to its neck. The insects that strike against the lamp fall into the funnel and slide down into the bottle. They are not damaged by the liquid, and they soon dry and are ready for mounting. A total of 70,224 individuals (33,879 Coleoptera and 16,181 Lepidoptera) were caught during 65 nights by this means. It was found that injurious Noctuids such as *Euxoa segetum*, Schiff., *E. tritici*, L., and *Feltia exclamationis*, L., are not attracted to light so readily as to sweet baits, while others such as *Phlyctaenodes sticticalis*, L., and *Plutella maculipennis*, Curt., show a stronger reaction to light. The possibility of using this light trap in conjunction with baits increases its value.

TROITZKY (N. N.). **Die Reblausfrage in Russland.** [The *Phylloxera* Question in Russia.]—*Anz. Schädlingsk.*, iii, no. 11, pp. 123–127, 1 map. Berlin, 15th November 1927.

A brief account is given of the occurrence of *Phylloxera vastatrix*, Planch., in the vine-growing regions of Russia around the Black Sea. Past measures have proved ineffective, and future investigations on this pest must have a scientific basis. The work will have to be done from both at fixed and mobile research stations. Eight of the former exist, and their duties are briefly noticed.

KALANDADZE (L.). **Beiträge zur Biologie der Florfliegen** (*Chrysopa* **sp.**). [Contributions to the Biology of Chrysopids.]—*Anz. Schädlingsk*, iii, no. 11, pp. 132–133, 2 figs., 1 ref. Berlin, 15th November 1927.

In the course of investigations on the woolly apple Aphis, *Eriosoma* (*Schizoneura*) *lanigerum*, Hausm., *Chrysopa septempunctata*, Wesm., *C. formosa*, Br., and *C. prasina* var. *abdominalis*, Burm., especially the first, were seen preying on the Aphids. One Chrysopid larva during its life can account for 40–60 full-grown and 120–140 immature Aphids.

MENZEL (R.). **Entomologische aanteekeningen.** [Entomological Notes.]—*Thee*, vii, no. 4, pp. 150–155, 2 figs., 8 refs. Buitenzorg, December 1926. [Recd. November 1927.]

The first note relates to the position of the Braconid, *Euphorus nigricarpus*, Szép., a parasite of *Helopeltis* in Africa, and reproduces the information by Lean [*R.A.E.*, A, xiv, 223]. The second reproduces a portion of a paper by Ferrière [A, xiv, 591] giving the characters distinguishing the Ichneumonids, *Stictopisthus javensis*, Ferr., *S. australiensis* and *S. africanus*. The first-named is a hyperparasite of *Helopeltis antonii*, Sign., in Java.

CUSHMAN (R. A.). U.S. Bur. Ent. **Miscellaneous Notes and Descriptions of Ichneumon-flies.**—*Proc. U.S. Nat. Mus.*, lxxii, art. 13, pp. 1–22, 2 figs. Washington, D.C., 1927.

The species dealt with include *Hemiteles* (*Aptesis*) *hemipterus*, F. (*insignipennis*, Schmiedk.), reared from the cocoons of *Hypera variabilis*, Hbst. (*Phytonomus posticus*, Gyll.) and a secondary parasite of *Pyrausta nubilalis*, Hb., through *Microgaster tibialis*, Nees, and *Eulimneria crassifemur*, Thom.

BARBER (H. S.). **A supposedly new Baridiid Weevil from Peruvian Sugarcane.**—*Proc. Ent. Soc. Wash.*, xxix, no. 7, pp. 149–150, 1 fig. Washington, D.C., October 1927.

Adults, pupae and larvae of *Eumycterus* (?) *saccharidis*, sp.n., are recorded from sugar-cane in Peru. The adult is described.

BÖVING (A. G.). U.S. Bur. Ent. **Immature Stages of** *Eumycterus* (?) *saccharidis* **Barber, with Comments on the Classification of the Tribe Barini (Coleoptera: Curculionidae).**—*Proc. Ent. Soc. Wash.*, xxix, no. 7, pp. 151–158, 1 pl., 1 fig., 3 refs. Washington, D.C., October 1927.

The mature larva and pupa of *Eumycterus* (?) *saccharidis*, Barber, are described. The larvae attack the heart of the terminal shoot of sugar-cane in Peru. The taxonomic position of the genus *Eumycterus* as evidenced by the larva is discussed; keys are given to the tribes of Curculioninae and the larvae of the genera of Barini in the National Museum.

REGAN (W. S.). **Results of different Insecticide Treatments on the Control of Codling Moth in the Pacific Northwest.**—20 pp. Watsonville, Cal., California Spray-Chemical Co., 1927.

This is the full text of a paper on experiments with several types of sprays for the control of the codling moth [*Cydia pomonella*, L.], an abstract and a summary of which have been noticed [*R.A.E.*, A, xv, 430, 635].

MARTELLI (G.). **La Formica argentina** (*Iridomyrmex humilis*, **Mayr**). [The Argentine Ant.]—*Circ. R. Osserv. Fitopatol. Puglie*, no. 7, 8 pp., 7 figs. Taranto, December 1926. [Recd. November 1927.]

The Italian Department of Agriculture issued on 1st July 1926 special regulations against the Argentine ant, *Iridomyrmex humilis*, Mayr, and a brief description of this pest and of its habits is given. It is best combated by a sweetened poison-bait composed of water 1¾ pints, tartaric acid crystals 30 grains, sodium benzoate 45 grains, sugar 2·2 lb., honey 3½ oz., and sodium arsenite 108 grains. This is placed in covered tins that are hung up on the trunks of the trees. Holes pierced in the sides of the tins enable the ants to reach the bait. Waxed paper bags with holes punched in the sides may be substituted.

di Cairano (V.). **La campa del mandorlo** (*Malacosoma neustria* **L.**). [The Lasiocampid of the Almond.]—*Circ. R. Osserv. Fitopatol. Puglie*, no. 8, 4 pp. Taranto, February 1927. [Recd. November 1927.]

Many trees, especially fruit-trees and particularly almonds, are defoliated by the caterpillars of *Malacosoma neustria*, L. The branches bearing the eggs of the moth should be cut off and kept until the eggs hatch and then replaced on the trees to facilitate the escape of its parasites. A lead arsenate spray of 1 per cent. paste or ½ per cent. powder, or a calcium arsenate spray ½ per cent. should also be used.

Martelli (G.). **Il** *Phloeotribus scarabaeoides* **Fabr.**—*Circ. R. Osserv. Fitopat. Puglie*, no. 9, 4 pp. Taranto, April 1927. [Recd. November 1927.]

The biology of *Phloeotribus scarabaeoides*, F., and the damage this beetle does to olives in Italy are briefly discussed. Drought, excessive pruning and scanty manuring all predispose the trees to attack. As the beetle oviposits in fallen twigs, all those that have fallen in pruning should be left until early May to act as traps. It is possible that fumigation with hydrocyanic acid gas may serve to disinfest the piles of branches and twigs that the peasants are in the habit of keeping near their houses.

Buffon (A.). **Guadeloupe: Crop Pests and Diseases.**—*Int. Bull. Pl. Prot.*, i, no. 8, pp. 123–126. Rome, September 1927.

The chief pest of sugar-cane in Guadeloupe is *Diatraea saccharalis*, and the leaf-miner, *Leucoptera* (*Cemiostoma*) *coffeella* is the most dangerous pest of coffee. *Dysdercus delauneyi* is the worst enemy of cotton. *Laphygma frugiperda* and *D. saccharalis* regularly attack maize. *Pieris virginica* occurs on cabbage and radish; *Protoparce sexta* on pepper and tomato; and *Heliothis* (*Chloridea*) *virescens* on pigeon pea [*Cajanus indicus*].

Hallage (R.). **Syria: Experiments on Locust Destruction.**—*Int. Bull. Pl. Prot.*, i, no. 8, pp. 126–127. Rome, September 1927.

The results are given of locust-destruction experiments carried out in March and April 1927 with a solution of pyrethrum-soap. In one of these, an area of about 55 sq. yards containing young locusts about 24 hours old was sprayed with about 9 pints of 2 per cent. strength; after 40 minutes, 70 per cent. of the locusts were dead. As this plot was not isolated, it was possible for other locusts to enter after spraying. Similarly successful tests were made on isolated plots of larger area, on which the locusts were older and a stronger solution was used. With a 5 per cent. solution, 95 per cent. of 10-day-old locusts were killed. Trials with a proprietary arsenical dust were also satisfactory.

CURRAN (C. H.). **Studies in African Tachinidae (Diptera).—II.**—*Bull. Ent. Res.*, xviii, pt. 2, pp. 103–128. London, December 1927.

This paper includes a revision of the African species of *Dexia* and *Sturmia* with keys, the latter genus being an important one in Africa from the economic standpoint, as many species attack major pests of staple crops.

MYERS (J. G.). **Natural Enemies of the Pear Leaf-curling Midge,** *Perrisia pyri*, **Bouché (Dipt., Cecidom.).**—*Bull. Ent. Res.*, xviii, pt. 2, pp. 129–138, 5 figs., 11 refs. London, December 1927.

A search for natural enemies of *Dasyneura* (*Perrisia*) *pyri*, Bch., with a view to their introduction into New Zealand, was made in France, where, as in England, the midge is scarcely regarded as a pest, and outbreaks seem to vary greatly both in intensity and place of occurrence every season. In 1925 only one natural enemy was known in Europe, and this record was overlooked. A statement by Miller in a paper already noticed [*R.A.E.*, A, xiv, 523] that Mercet had reared *Inostemma piricola*, Kieff., from this species was based on an error in this *Review* [A, vi, 113] where the host was given as *D. pyri* instead of as *Contarinia pyricola*, Riley. *I. piricola* has not been recorded from *Dasyneura*.

The eggs of *D. pyri* are laid in young pear shoots between the folds of the budding foliage, and the larvae live in the rolled leaves, forming a persistent pseudo-gall and eventually blackening and killing all or part of the leaf. The full-fed larvae drop to the ground and burrow 1–2 cms. into the surface soil, constructing frail cocoons of silk mixed with earth particles. In most cases the pupa leaves the cocoon and comes to the surface of the ground for the adult to emerge. Larvae kept in their rolled leaves under perfectly dry conditions went into a kind of aestivating state (hypnody) in which no further development occurred, the fat-body becoming enormously enlarged and filling almost every interstice of the body. A similar change occurred in full-fed larvae waiting to pupate. In this state, under dry conditions, larvae of various ages were kept for over a month, whereas larvae under moist conditions pupated and produced adults in less than a fortnight from the date of collection. Those kept dry for over a month proceeded with their development when removed to a moist environment. This suggests a good method of shipping the endophagous parasites. It has been stated that there is a second generation at the end of August, but these observations indicate a continuous series of overlapping generations throughout the season, beginning in May or even earlier and continuing till the cold of the autumn. *D. pyri* has been observed in some abundance at Florence.

There seems an interesting parallel between the parasites of *Contarinia* and *Dasyneura*. The former is attacked by the Scelionids, *I. piricola* and *Platygaster lineatus*, Kieff., and the Pteromalid, *Tridymus piricola*, Marchal, while the chief parasites of the latter are *I. boscii*, Jur., *Misocyclops* (*P.*) *marchali*, Kieff., and the Torymid, *Torymus abbreviatus*, Boh. The species of *Inostemma* and *Platygaster* and the Chalcids mentioned by Miller [*R.A.E.*, A, xiv, 523] are *I. boscii*, *M. marchali* and *T. abbreviatus* respectively.

The young pear shoots form the centre of an interesting biocoenose. Some Lepidopterous larvae exploit them and are the hosts of the

Braconids, *Apanteles longicaudis*, Wesm., *A. xanthostigmus*, Hal., and *Meteorus ictericus*, Nees, which were reared from rolled leaves or observed frequently among the young shoots. Various thrips abundant in the rolled leaves are preyed on by the Anthocorids, *Triphleps minuta*, L., and *Anthocoris nemorum*, L., of which the former also attacked adults and possibly eggs of *Dasyneura* in the field, while the latter fed on larvae in captivity. The leafhoppers, *Eupteryx stellulata*, Burm., and *Alebra albostriella*, Fall., the Psyllid, *Psylla pyri*, L., and at least two species of Aphids suck the sap, and the last two are attended by ants, which in their turn are mimicked by the Capsid, *Pilophorus perplexus*, D. & S., which feeds on *P. pyri* and *Dasyneura*. A mite preys on the adult midges while ovipositing, and spiders catch most of the above species as well as *Inostemma boscii*. The parasites of *Dasyneura* and the midge itself are also usually active on the pear shoots. The Capsids, *Heterotoma merioptera*, Scop., and *Megacoelum beckeri*, Fieb., are also definitely members of the complex.

I. boscii was first observed in July ovipositing in brilliant sunshine in the eggs of *Dasyneura*. It occurred in equal numbers with *Misocyclops marchali*, though towards the end of August the latter was the more abundant. Oviposition takes half to one minute, which is slower than *Misocyclops*, and owing to its much longer ovipositor, *Inostemma* could exploit more deeply deposited eggs than *Misocyclops*. Only one egg was found in each host. Oviposition may occur from the middle of July to the middle of August, but development had proceeded no further than the primary larva at the latter date. This suggests that the later stages are passed in the wintering larvae of the host, but this explanation is open to many objections. *I. boscii* has also been recorded from *Dasyneura* (*Cecidomyia*) *brassicae*, Winn., *D.* (*C.*) *salicina*, DeG., and *Cydia pomonella*, L., though the last record is almost certainly an error.

M. marchali reaches eggs near the surface of the buds. Only one egg was found in each egg of the host. This parasite works in weather not favourable enough for *I. boscii*, but requires sunshine for full activity. No larvae were obtained or reared. The only other recorded host is *Dasyneura* (*Perrisia*) *ulmariae*, Bremi.

Torymus abbreviatus always pierces the actual leaf, never inserting the ovipositor between the folds as the Scelionids invariably do. The larger females choose older leaves with consequently larger larvae. Usually only one larva or egg of the parasite is present in one curled leaf. The egg is deposited on the inside of the leaf curl. The period from egg-laying to completion of larval feeding was about 10 days in August. The duration of the pupal stage is not known, but adult midges emerged 12–13 days after collecting, while the parasites began to appear in 15 days and continued to emerge for a further 6 days. Males emerged first, females not appearing until 5 days after the first male and on the same day as the last one. In similar material kept in dry sand the parasites emerged after 18–25 days. Pairing occurred immediately. No examples survived captivity more than a few days. Oviposition takes place actively in dull weather and even during light rain. Other hosts recorded in the literature are *Dasyneura* (*Perrisia*) *rosarum*, Hardy, *D.* (*P.*) *persicariae*, L., *Dasyneura pini* (?=*pyri*, Bch.), *Urophora cardui*, L., and the Cynipids, *Aulacidea hieracii*, Bch., *Cynips conglomerata*, Giraud, and *Dryophanta disticha*, Htg.

Pilophorus perplexus mimicked an ant that attended Aphids on the same twigs. It is active in all weathers, and both nymphs and adults, with the rostrum applied to a rolled pear leaf, suck a hidden midge larva. During July and August this Capsid caused greater mortality among the larvae of *Dasyneura* than all other factors combined. The eggs are not known, but all the other stages were collected.

Other Hymenoptera reared have been determined and listed by Ferrière [*R.A.E.*, A, xv, 462].

GAHAN (A. B.). U.S. Bur. Ent. **On some Chalcidoid Scale Parasites from Java.**—*Bull. Ent. Res.*, xviii, pt. 2, pp. 149–153, 2 figs. London, December 1927.

Comperiella bifasciata, How., and *Physcus varicornis*, How., var. *intermedius*, n., were reared from *Chrysomphalus ficus pallens*, Green ; *Comperiella unifasciata*, Ishii, another Encyrtid, *Spaniopterus crucifer*, gen. et sp. n., *Aphelinus chrysomphali*, Mercet, and *Casca parvipennis*, sp. n., from *Aspidiotus destructor*, Sign. ; *Chiloneurinus microphagus*, Mayr, from *A. destructor* and *C. ficus pallens* ; and *Aspidiotiphagus citrinus* var. *agilior*, Berl., from *C. ficus pallens* and *Aspidiotus palmae*, Morgan & Ckll.

COWLAND (J. W.) & RUTTLEDGE (W.). **Notes on Cotton-stainers** (*Dysdercus*) **in the Sudan.**—*Bull. Ent. Res.*, xviii, pt. 2, pp. 159–163, 1 map. London, December 1927.

This is a preliminary note on the difference that apparently exists between the habits of *Dysdercus* in the northern rain-cotton belt of the Sudan and those recorded in other parts of Africa where cotton is a well-established industry. Owing to the introduction of American cotton seed in 1925, the area under cotton has been considerably increased, and consequently the damage by stainers has increased where they were formerly associates of the tebeldi or baobab tree (*Adansonia digitata*). Three species of *Dysdercus* occur in the region, *viz.*, *D. fasciatus*, Sign., which is the predominant species, *D. superstitiosus*, F., met with in small numbers, and *D. nigrofasciatus*, Stål, which has not been observed in the Nuba Mountains. It is, however, doubtful if these are all distinct species. The northern limit in the Sudan is determined by the rainfall ; with a rainfall of less than 20 ins. *Dysdercus* does not occur, except as occasional individuals.

In the Sudan *Dysdercus* is able to complete its life-cycle on the seed of baobab, kapok and cotton. The kapok tree (*Eriodendron anfractuosum*) is not indigenous and need not be considered an important factor. When attacking cotton, nymphs of the second instar are usually found in open bolls, but nymphs of the later instars and adults feed on green unopened bolls, being able to penetrate to the seed through the carpels. On emerging from the egg the nymphs remain clustered in the soil for 2 or 3 days and do not feed until they have reached the second instar.

The baobab tree is indigenous and flowers during April and May before the onset of the rains. Some fruits fall in September or shortly after, but on other trees they remain until the next rainy season. On the ground termites devour the floury substance in which the seeds are embedded, and it is only when such seeds are freed that the bugs feed on them. The interior of the seed has a high oil content and the bugs presumably feed on the oil, but the seeds are of no commercial value.

The following life-history of *Dysdercus* on baobab is based only on a single season's observations. At the end of June, when the rains are well established and humidity is high, the bugs feed freely on fallen seeds on the ground, and at other times cluster under stones and similar places and in crevices in the trunk, but there is no evidence that the tree suffers from their presence. When the colony is relatively strong, some adults migrate in the morning or evening. They have been observed on cotton 1½ miles from the nearest baobab. These wandering bugs do not seem to be specially attracted to cotton, but having found it remain to breed, and it is possible that they may develop the habit of migrating from baobabs to cotton when the latter is grown on a large scale for some years. The rest of the colony persisting on baobabs continues to breed rapidly until the rains cease in October. During this period a few individuals may migrate from time to time. When the rainy season ends and the wind changes, there is an increasing mortality among the nymphs due to the drier atmosphere, the decrease in soil moisture and the diminution of shade as a result of the tree shedding its leaves. By the end of January the bugs are no longer conspicuous on the tree trunk, but are found under rubbish at the base, in the soil and inside fallen and broken fruits. It is believed that many colonies become extinct during this period from January to June, if the season is unusually hot and dry.

An exceedingly promising remedial measure was the use of painter's blowlamps, but the season was an unusual one, and it may not prove practicable in a more normal year. The best line of attack appears to be to destroy colonies on baobab during the active breeding season.

CURRAN (C. H.). **Three new Tachinidae attacking injurious Insects in Queensland.**—*Bull. Ent. Res.*, xviii, pt. 2, pp. 165–167. London, December 1927.

Alophora aureiventris, sp. n., and *Catharosia varicolor*, sp. n., were reared from *Dysdercus sidae*, Montr., and *Ballardia pallipes*, gen. et sp. n., from *Euxoa radians*, Guen., in Queensland.

WILKINSON (D. S.). **On the Indo-Malayan Species of the Genus** *Microgaster* (**Hymenoptera, Braconidae**).—*Bull. Ent. Res.*, xviii, pt. 2, pp. 171–178, 3 figs. London, December 1927.

Among the species dealt with are *M. indicus*, sp. n., bred from larvae of the Pyralid, *Pyrausta machaeralis*, Wlk., in India, and *M. psarae*, sp. n., bred from larvae of another Pyralid, *Psara bipunctalis*, F. (*Pachyzancla aegrotalis*, Zell.) in India and Malaya.

MASSEE (A. M.). **On the Species of Gall Mites (Eriophyidae) found on the Genus** *Ribes*.—*Bull. Ent. Res.*, xviii, pt. 2, pp. 179–181. London, December 1927.

All stages of *Phyllocoptes masseei*, Nal., are found on the lower surface of black currant leaves during the latter part of July and in August in England. They may be detected earlier in the season, but are difficult to find owing to their small numbers. Eggs can be observed on the leaves but are difficult to see. Towards the end of August and in September very few mites remain on the leaves, the majority seeking shelter under the bud scales for the winter. They are invariably found singly under the scales. In the early spring they migrate to the leaves and continue their life-cycle on the open bush. This mite is probably more plentiful than is generally supposed, but it does not damage or deform the leaves to any marked extent; only in severe cases of attack are slight mottlings noticeable on the upper surfaces. *Eriophyes ribis*, Nal., is distributed throughout the British Isles, Central Europe, and British Columbia, attacking red and black currants, gooseberry, *Ribes alpinum*, and *R. sanguineum*. *Oxypleurites neglectus*, sp. n., is rare in England and is found on the lower surface of leaves of black currant during the summer months, usually in association with *P. masseei*. *O. depressus*, Nal., has been found in England feeding on the lower surface of hazel leaves. Descriptions of the three currant mites are given, with a key to the genera.

HARRIS (W. V.). **On a Lycaenid Butterfly attacking Pineapples in Trinidad, B.W.I.**—*Bull. Ent. Res.*, xviii, pt. 2, pp. 183–188, 2 pls., 4 refs. London, December 1927.

The pineapple is indigenous in Central America and probably in Trinidad also. In October 1926 and the previous season many pineapples in Trinidad were rendered unsaleable owing to the attacks of a Lycaenid, *Tmolus echion*, L. (*Thecla basilides*, Geyer). The injury to the fruit is indicated superficially by the exudation of gummy matter from the points of attack. Removal of the gum shows either an irregular shallow depression, or, more usually, a small circular hole leading into the interior. Inside the fruit the larva usually makes a small cavity before proceeding towards the surface again, these burrows usually extending inwards for more than one-third of the diameter of the fruit. As the fruit develops the holes fill up with gum, which preserves a stiff jelly-like consistency, while turning a deep brown colour. The edges of the wound blacken and frequently become secondarily infected with a green fungus and by Nematodes and various insects, etc., all of which further disintegrate the fruit. Soft rot has been noticed apparently spreading from injury by this Lycaenid. Unsuccessful attempts were made to produce gum secretion by mechanical injury, so that it appears to be a specific reaction to *Tmolus* larvae. Somewhat similar injury has been recorded from Grenada on pineapples attacked by the weevil, *Cholus wattsi*, Mshl., but can be distinguished from the damage by the Lycaenid as most of the injury is caused by the larvae feeding on the fruit stalk and in the centre of the developing fruit.

A description is given of all stages of *T. echion*. The majority of eggs are found on the small flowering heads while still down among the leaves, a few being seen on heads after the first three rows of flowers have opened. The first signs of attack are thus found on the lower part of the fruit. Eggs are laid singly, widely separated, usually attached to the base of a scale, some on the buds and some on the stem just below the head. They hatch in 3–5 days; those laid on foreign matter such as dead leaves inside the rosette were never observed to hatch. The larva immediately seeks a suitable place for entering the young pineapple, and is very active at this stage. The tender fleshy base of a scale where it is attached to the main body is usually attacked. Opening flowers are eaten into direct through the petals to the ovary. Unopened buds are entered at all points. The initial burrows are usually shallow and confined to the lower parts of the fruit. When the fruit is further developed and the flowering finished, the rapidly growing larva seeks a further entrance, making a cavity below the surface, so that it is less exposed to predators. After 13 to 16 days the larva reappears, descends the fruit stalk to the leaves about the base, and pupates in 24 hours. Occasionally pupae have also been found among large basal suckers. The pupal stage occupies 7–11 days, the complete life-cycle thus requiring 23 to 32 days.

In Trinidad alternative food-plants are wild pines, *Aechmea*, which is a closely related genus, and *Heliconia*. The life-cycle is uninfluenced by the different food-plants, and the presence of these plants on trees on an estate or in surrounding bush will act as foci of infestation.

A Chalcid larval parasite, apparently *Heptasmicra* sp. [since identified as *Spilochalcis ashmeadi*, Cam.], was bred on two occasions. In one instance it emerged eight days after the host larvae had pupated apparently normally. *Polistes rubiginosus*, Lep., was present in numbers when the pineapples were flowering, and may exercise a definite control over the Lycaenid when present in sufficient numbers. The susceptibility of different varieties of pineapple to attack are discussed. Spraying the pineapples with Bordeaux mixture, 5:5:50, in February when the majority of the flowering heads were just appearing, proved of some benefit. Early application is essential to ensure the pest being in the egg or young larval stage, as more mature larvae are unaffected by spraying, probably owing to their rarely feeding on the surface.

Pineapples heavily infested in the early stage should be removed and burnt, and suckers should not be left lying about in heaps on the beds after being picked. When attack is at all likely, pineapples should be grown in not more than three rows to a bed so as to increase the facilities for detection and remedial measures.

WATERSTON (J.). **On the Hedycryptine Genus** *Oneilella*, **Cam. (Hym., Ichneumonidae).**—*Bull. Ent. Res.*, xviii, pt. 2, pp. 189–204, 8 figs., 8 refs. London, December 1927.

This is an attempt to summarise present knowledge of *Oneilella* and its hosts. The material examined is with one doubtful exception African in source.

Among the species dealt with are *O. caudata*, sp. n., from cocoons of *Anaphe reticulata*, Wlk., in South Africa; *O. latifascia*, sp. n., from nests of *A. panda*, Boisd., in Uganda and of *A. infracta*, Wals., and *A. venata*, Butl., in Belgian Congo, also occurring in Madagascar; *O. analis*, sp. n., from *A. moloneyi*, Druce, and *O. nigeriensis*, sp. n., from *A. venata* in Nigeria; and *O. linearis*, sp. n., probably from *A. ambrizia*, Butl., in British Sudan.

BRÈTHES (J.). **Parasites and Hyperparasites of** *Diatraea saccharalis* **in Tucumán Sugar-cane.**—*Bull. Ent. Res.*, xviii, pt. 2, pp. 205–207. London, December 1927.

This paper has been translated from *Revista Industrial y Agrícola de Tucumán*, xvii, nos. 7–8, pp. 163–166, December 1926–January 1927. The parasites described from *Diatraea saccharalis*, F., in Tucumán, Argentina, are *Microdus crossi*, sp. n., *Ipobracon* (*Iphiaulax*) *tucumanus*, Brèthes, and *Sarcophaga diatraeae*, sp. n. The latter is parasitised by the Diapriid, *Aulatopria tucumana*, gen. et sp. n.

Torres Ortiz (J.). **Estudio biológico sobre el** *Aphelinus mali.*—*Agronomía*, xvii, no. 3, pp. 106–108, 2 pls. Santiago, November 1927.

This is a brief account of a biological study of the Chalcid, *Aphelinus mali*, Hald., in Chile. The females laid 5 or 6 eggs an hour in the hosts [*Eriosoma lanigerum*, Hausm.] on apple, always in the early morning or towards nightfall. Most of the adults emerged in 20–29 days after oviposition; but in a few cases development required 32–50 days. All the adults observed were females. During a period of two years there was an average of 6–7 generations a year. The adults may live for a maximum of 52 days. The winter is passed in the egg within the Aphids that have migrated to the roots of the apple trees.

Townsend (C. H. T.). **El " Piojo Blanco "** [White Scale] (*Hemichionaspis minor*).—*Vida agric.*, iv, no. 46, pp. 841–844. Lima, October 1927.

Pinnaspis (*Hemichionaspis*) *minor*, Mask., is a pest of cotton in some parts of Peru where there is an extreme drought in the hot season. Such measures as the clearing away of all débris and early and severe pruning are recommended.

Urich (F. W.), Hardy (F.) & others. **Progress Reports.**—*Trinidad & Tobago: Min. & Proc. Froghopper Invest. Comm.*, pts. viii & ix, pp. 211–306, 1 pl., refs. Trinidad, 1927.

An account of the sugar-cane froghopper [*Tomaspis saccharina*] as occurring in Trinidad has been compiled from the observations of previous investigations, and the present situation is discussed and the methods of dealing with the pest as at present practised are reviewed. The eggs apparently require a high degree of humidity for hatching; in the laboratory, hatching occurred freely at 100 per cent. humidity, but at anything less than 90 per cent. eggs hatched only slowly and sporadically. Further tests with calcium cyanide against the eggs [*R.A.E.*, A, xv, 583] proved that this dust is completely lethal in the laboratory and should be efficient in the field if thoroughly applied under careful supervision.

Jackson (T. P.). **Work connected with Insect and Fungus Pests and their Control.**—*Rep. Agric. Dept. St. Vincent 1926*, pp. 9–14. Trinidad, 1927.

An unprecedentedly severe attack of *Alabama argillacea*, Hb. (cotton worm) occurred in 1926 [*R.A.E.*, A, xv, 96]. The life-cycle was found to occupy from 23 to 28 days, the egg stage lasting 3 days, the larval stage 14–17 and the pupal stage 6–8. A certain degree of control was effected by natural enemies including *Trichogramma* sp., *Polistes annularis*, L., and Chalcids, possibly *Brachymeria* (*Chalcis*) *ovata*, Say. *Anomis* (*Aletia*) *luridula*, Gn., also infested cotton in January 1927, but the attack was light and did not develop.

Little damage was done by *Platyedra gossypiella*, Saund. (pink bollworm), except in two localities; in the Southern Grenadines the drought and sunshine that prevailed during the ripening of the bolls were unfavourable to its development. Observations of an experimental plot of cotton infested with the bollworm showed a rapid increase in the proportion of bolls affected from 3 per cent. on 11th November to 100 per cent. on 23rd December. A decrease in infested seed at the ginnery in March and April was possibly due to the fact that a mite, *Pediculoides* sp., was found attacking 9·5 per cent. of the larvae in the seed examined.

The control measures employed against *Dysdercus delauneyi*, Leth. [*R.A.E.*, A, xiv, 86] were again successful except in the case of a field of arrowroot where cotton meal had been scattered and six weeks was required to secure control, and in a cotton field where disintegrated cotton seed had been applied without being thoroughly covered and where control was effected in a fortnight. Towards the end of the season a large number of silk cotton trees (*Eriodendron anfractuosum*) were cut back or felled.

Arrowroot was attacked by *Calpodes ethlius*, Cram. (arrowroot worm), which destroys the foliage. The eggs are parasitised by *Trichogramma* sp. Other pests recorded were also mentioned in the preceding report [*R.A.E.*, A, xv, 51].

DAMPF (A.). **La *Trioza* del aguacate.** [The *Trioza* infesting Avocado.]—*Bol. mens. Defensa agric., Sec. Agric. y Fomento, Mexico*, i, no. 5, pp. 436-437, 2 figs. S. Jacinto, D.F., October 1927.

As it is not certain whether the Psyllid attacking avocado [*Persea gratissima*] in Mexico is *Trioza magnoliae*, Ashm., or *T. koebelei*, Kirk., figures of its male genitalia are given.

DAMPF (A.). **La chinche del arroz en el valle del Yaqui, Son.** [The Rice Bug in the Yaqui Valley, Sonora.]—*Bol. mens. Defensa agric., Sec. Agric. y Fomento, Mexico*, i, no. 4, pp. 271–283, 5 figs. S. Jacinto, D.F., September 1927.

A native Pentatomid, *Mormordea angustata*, Stal, has recently attacked rice in the Yaqui valley in the Mexican State of Sonora, causing a loss estimated at £200,000 in 1927. It lives on grasses, and when rice was cultivated it was found on the various grasses, such as *Panicum colonum*, that spring up in the rice-fields. It disappears during the dry season and is believed to fly to a distance in search of other food. A female lays from 12 to 24 eggs on the blades of grass. The larvae hatch in a few days and moult five times before becoming adult. In the meantime the grasses die as the rice grows, and the bugs are forced to attack the tender shoots of the latter. The elimination of the grasses would perhaps prevent *M. angustata* from becoming a pest. If prior to cultivating rice the field were cleared of grasses except for belts left to attract the bugs on their return, these trap-plants and the bugs on them might be destroyed. For the present light-traps and hand-nets should be used.

This paper is followed by a note (pp. 284–285) recording the beginning of work against *M. angustata*, the measures taken being inspection of the areas, collection of data regarding the various stages of the pest, and cultivation of the ground, which has resulted in the destruction of grasses.

Cuarentena interior numero 1. [Mexican Inland Quarantine No. 1.]—*Bol. mens. Defensa agric., Sec. Agric. y Fomento, Mexico,* i, no. 4, pp. 252–261. S. Jacinto, D.F., September 1927.

A quarantine operating in the interior of Mexico has been established with a view to checking the spread of the pink bollworm of cotton, *Platyedra* (*Pectinophora*) *gossypiella,* Saund.

Back (E. A.) & Cotton (R. T.). **Effects of Cold Storage upon Clothes Moths.**—*Refrig. Engin.,* xiii, no. 12, pp. 365–366, 1927. (Abstract in *Expt. Sta. Rec.,* lvii, no. 7, p. 657. Washington, D.C., 1927.)

Cold storage at a temperature of from 40° to 42° F. furnishes absolute protection against clothes moths, although such temperatures may not kill the larvae. Data are given on the relative resistance of clothes moth adults, eggs and larvae.

Davis (J. J.). **Insects of Indiana for 1926.**—*Proc. Indiana Acad. Sci.,* xxxvi (1926), pp. 293–308, 10 figs. Indianopolis, Ind., 1927.

Records are given of a large number of insects observed in Indiana in 1926, many of which were mentioned in other reports [*R.A.E.,* A, xv, 4, 402]. The abnormally cold weather in March and April considerably delayed insect activity. The grasshoppers, *Melanoplus femur-rubrum,* DeG., and *M. differentialis,* Thos., were more general and destructive to a variety of crops than in 1925. Adults of *Lachnosterna* spp. were unusually abundant, and complete defoliation of timber trees occurred in some districts. *Cirphis unipuncta,* Haw., was also unusually abundant, the crops damaged including timothy [*Phleum pratense*], oats, wheat and maize.

Rules and Regulations made by the State Plant Board pursuant to the Florida Plant Act of 1927.—*Mon. Bull. Florida Pl. Bd.,* xii, no. 4, pp. 77–107. Gainesville, Fla., October 1927.

These Rules and Regulations under the Florida Plant Act [*R.A.E.,* A, xvi, 19] became effective 1st January 1928 and regulate the sale, movement, etc., of plants, etc., to prevent the introduction and spread of insect pests and plant diseases.

Guyton (T. L.) & McCubbin (W. A.). **Rose Insects and Diseases.**—*Bull. Penn. Dept. Agric.,* no. 441, 17 pp., 8 figs. Harrisburg, Pa., March 1927.

An account is given of the common pests of rose in Pennsylvania and the means of controlling them, with a spray schedule and notes on the preparation of insecticides.

Allen (H. W.). **Biology of the Red-tailed Tachina-Fly,** *Winthemia quadripustulata* **Fabr.**—*Tech. Bull. Miss. Agric. Expt. Sta.,* no. 12, 32 pp., 9 figs., 48 refs. A. & M. College, Mississippi, August 1925. [Recd. 1927.]

Winthemia quadripustulata, F. (red-tailed Tachinid), all stages of which are described, is holarctic in distribution and a very polyphagous parasite ; a list of 48 Lepidopterous hosts of various families recorded in Europe and North America is given. Coleoptera are very occasionally attacked. It is, however, pre-eminently a parasite of the larvae of Noctuids of the cutworm and armyworm habit, and is of great value in Mississippi, where it attacks some of the more serious crop pests. It is of importance in the control of *Xylomyges* (*Prodenia*) *eridania*, Cram. (southern army-worm) and *Lycophotia margaritosa*, Hb. (variegated cutworm), as well as of *Heliothis obsoleta*, F., when the larvae are foliage feeders, though if they only attack maize ears, bean pods or tomatos they are rarely parasitised.

Although the adult flies will readily feed on a great number of sweet substances, when reared in the insectary they have only been found to oviposit if Aphid honeydew is combined with the other foods, and in no case have eggs thus obtained hatched. In the field adults have been observed feeding upon honeydew secreted by Aphids of various species, occasionally on the bloom of *Euphorbia nutans* or at the nectaries on the leaf petiole of peach, but most frequently on those on the fruiting stems of cowpeas, which tend to attract this insect, and for this reason alone their cultivation should not be entirely discarded in favour of more profitable leguminous crops. The flies are most frequently present in low-lying open fields, covered with succulent herbaceous vegetation, and are widely distributed during the spring, when the humidity is high and such plants are plentiful ; later in the season, however, when the soil becomes dry, they may only be found in small colonies, or as more or less isolated individuals on the lower land. On several occasions during the summer of 1924 colonies of males were observed over barren dry ground where they were not associated with infestations of favoured hosts or the abundance of food material. The fact that most of the numerous specimens captured from an infestation of *Laphygma frugiperda*, S. & A., proved to be females is another instance of the segregation of the sexes of this species in the field.

The parasite hibernates in the soil as a full-grown larva ; in 1924 pupae were present from 7th March to 3rd April, and the first adult emerged on 15th April. There are generally four to five, considerably overlapping, generations in a year. Pairing takes place shortly after emergence, and after a pre-oviposition period of several days the adults seek their hosts in the fields. The eggs are generally deposited on the last two thoracic segments of the larvae ; if they are placed further back than this, they are frequently crushed by the mandibles of the host. The largest number of eggs deposited by a single female in the insectary was 55 ; the number deposited on one individual depends on the size of the host and the ratio existing between the host population and the parasite population in the field. Seven or eight maggots can develop successfully in large caterpillars. If the host dies, before the normal death due to parasitism, the parasites do not mature ; occasionally, however, when the death of the host occurs two days after the penetration of the larvae, they may survive. For this reason the poisoning of nearly full-grown larvae of the hosts of this species would be of questionable value.

After an incubation period lasting, on an average, 5 days in May or 2–3 days in August and September, the larvae hatch and penetrate into the body of the host, the egg-shells of the parasite remaining attached to it. The larval stage lasts 5 days in May and about 3 days in August ; the hibernating larvae remain in this stage, on an average, 145 days. Pupation occurs in the soil. When emerging from the body of the host above the ground, larvae burrow into the soil, and when emerging below the soil, they burrow away from the host. The pupal stage lasts on an average 10 days, or in the case of the hibernating generation 24 days. The complete life-cycle under favourable summer conditions varied from 22 to 33 days.

It has not yet been determined whether the success of *W. quadripustulata* is dependent on the status of a favoured host or upon a seasonal succession of host larvae; it is possible that it is largely independent of the status of any one of its many hosts. There is a certain amount of competition within the species and with other parasites for possession of the host; it is not known to what extent the latter is unfavourable to the fly, but the former only results in any important loss of efficiency when the hosts are very greatly overstocked with eggs.

WOODHILL (A. R.) & ALLMAN (S. L.). **The Dicky Rice Weevil** (*Maleuterpes* (*Prosayleus*) *phytolymus*, **Olliff**).—*Agric. Gaz. N.S.W.*, xxxviii, pt. 10, pp. 791–799, 2 pls., 1 fig., 2 refs. Sydney, 1st October 1927.

Owing to the damage caused in New South Wales by *Maleuterpes phytolymus*, Oll. (dicky rice weevil) since it was investigated some years ago [*R.A.E.*, A, viii, 333], a further study has been made of it, with particular reference to possibilities of control. The winter is probably passed in the larval or pupal stage, and in the spring (August and September) these stages are found at depths of from 4 to 9 inches in the soil. *Citrus* was the only food-plant found by the authors, though Olliff recorded the weevil on peach and garden plants. The larvae feed on the roots of *Citrus*, especially of nursery stock. The adults cause the chief damage by attacking the skin of the fruit, particularly in the early stages of its development, forming a network of irregular furrows, which turn black, producing marked disfigurement; they also attack the foliage, preferring the tender young growth. They have never been known to fly and are normally unable to gain access to a tree unless they can crawl on to it. Experiments have shown, however, that they are capable of crawling a distance of 40 feet from tree to tree. Up to 70 per cent. of the fruit may be badly disfigured, and growth may be retarded or arrested by the attack on the foliage.

The results of tests with certain arsenical bait-sprays and bird-lime bands are described; none of these was successful, but two proprietary adhesive banding materials gave excellent results. They were applied on bands of grease-proof paper tightly tied or pasted round the trunks of the trees. The branches should be jarred with a padded mallet immediately before banding to shake off any weevils present, and the bands should be applied in the spring just before the fruit begins to set. The trees should be pruned so that all branches are at least 6 inches above the ground, and all weeds and grass likely to enable the weevils to reach the branches should be cut down. If the surface of the bands becomes coated with dust, they should be scraped with a flat stick, and if necessary, a little more material should be added.

VAN DER MEER MOHR (J. C.). **Eenigen wenken voor de bestrijding van de bladluizenplaag** (*Myzus persicae*) **in de Deli-tabak.** [Some Hints on Work against *M. persicae* on Tobacco in Deli.]—*Vlugschr. Deli Proefst.*, no. 42, 7 pp., 1 pl. Medan, 1927.

Myzus persicae, Sulz., is a serious pest of tobacco in Deli, Sumatra. The seed-beds are infested from the adjacent forests, while the young plants in the field are either infested in the same way or by the introduction of infested seedlings from the beds. If the beds are very badly infested the seedlings should be destroyed or dipped in derris solution, experiments having shown that this does not harm them. In the plantations a daily watch should be kept for the first traces of infestation. Spraying with a solution of derris is advised ; the application must be repeated after 4–5 days.

BEGEMANN (H.). **Verslag van den Entomoloog over het jaar 1926.** [Report for 1926 of the Entomologist of the Coffee Berry Borer Fund.]—*Meded. Koffiebessenboeboek-Fonds*, no. 15, 21 pp. Malang, 1927. Also in *Arch. Koffiecult*, i, no. 7. Batavia, 1927.

The study of the biology of the parasite [*Prorops nasuta*, Wtrst.] introduced from Uganda against the coffee berry borer [*Stephanoderes hampei*, Ferr.] [*R.A.E.*, A, xiv, 437] was continued. It was found to live about 24 days, and on an average, it destroyed four eggs and two larvae or pupae a day, each adult thus destroying during its life about 100 eggs and 50 larvae or pupae, whereas a borer beetle lays only about 32 eggs [*cf. R.A.E.*, A, xii, 201]. An investigation on the combined effect of temperature and humidity on the parasite is being conducted, owing to the observation that few parasites are bred in the rainy season. As regards the spread of *P. nasuta* in the field, the number of borer-infested berries containing it is still quite small, but is slightly increasing. It is chiefly found in the black berries, a fact that should prove useful in rendering harmless the black berries lying on the ground after the harvest. The value of co-operation between the experiment stations and the planters is emphasised ; in one case about £700 was saved in direct measures by discontinuing the work as a result of examinations of the coffee berries. The influence of ants on infestation by *S. hampei* is to be studied.

Other pests of coffee included the twig borer [*Xyleborus morigerus*, Blandf.], information regarding which has already been noticed [*R.A.E.*, A, xvi, 115]. There are at least five coffee twig-borers, of which the brown species, *X. coffeae*, Wurth, predominates in East and Central Java, while the black one, *X. morstatti*, Hag., predominates in Sumatra and West Java. Limacodid caterpillars, believed to be a species of *Nagoda* not previously recorded from coffee, severely injured the young plants. The Capsid, *Ragmus importunitas*, Dist., killed the green manure plant, *Crotalaria anagyroides*, but left *C. usaramoensis* untouched. The foliage of various green manures, especially *Centrosema pubescens*, was attacked by *Epicauta rufipes*, Ill., but the value of the larvae as parasites of locust eggs more than compensates for the damage done by the adults. Annother green maure plant, *Indigofera endecaphylla*, was attacked by *Dichomeris ianthes*, Meyr

Mann (H. H.) & Burns (W.). **The Locust Attack of 1926-27 in Sind, Kathiawar and Gujarat.**—*Agric. J. Ind.*, xxii, pt. 5, pp. 325–332. Calcutta, September 1927.

Swarms of locusts have appeared locally in various districts in north-west India. The attacks began in the latter part of 1926, reached their height in the December of that year and died away during February 1927; later another attack occurred, which had not ended in June. The dates on which swarms were reported from the different localities are given, with notes on the severity and extent of the attacks. The plants attacked during these infestations are discussed; wild ones were preferred, but no crop remained absolutely untouched. The pest is exceedingly difficult to control, since there is rarely any information as to the origin of the swarms or the final direction of their flight, and although the insects could be readily dealt with in the immature stages, little can be done when they have become adult. In some districts the swarms were prevented from settling by the use of smoke, movement of people, etc. At night the locusts are inert and may be destroyed by trampling or burning.

[King (H. H.).] **Report of the Government Entomologist for the Year 1926.**—*Bull. Wellcome Trop. Res. Labs.*, Ent. Sect. no. 24, 6 pp., 1 map. Khartoum, January 1927.

Despite the fact that there have been no serious outbreaks in the Sudan for the last ten years, locusts must be regarded as potentially the worst pest in the country. An account is given of observations showing that *Schistocerca flaviventris*, Burm., is the solitary phase of *S. gregaria*, Forsk. [*R.A.E.*, A, xiv, 571].

Termites are being studied especially with reference to their attacks on cotton. There are ten species in the district in which observations are being made. Termites attack the cotton plants at two periods, first when they are in the seedling stage and again when they are about six weeks old; a small hole is bored into the root, which is then hollowed out, resulting in the death of the plant.

Timber may be most effectively protected from the attacks of this pest by immersion for 24 hours in a 10 per cent. solution of sodium arsenite, the timber being afterwards painted or tarred to prevent the sodium arsenite from being washed out by rain, etc. Even 12 hours soaking in a 5 per cent. solution protected timber in infested soil for 3½ years. A 22 per cent. solution of copper sulphate did not give equally satisfactory results. A mixture of potassium bichromate and gum arabic has been recommended as a means of preventing termites from entering cement and attacking timber, but experiments indicated that neither potassium nor sodium bichromate alone or in conjunction with gum arabic had any effect in protecting timber, while gum arabic when mixed with cement resulted in the setting properties of the latter being seriously impaired.

A considerable amount of evidence has been obtained, indicating that the susceptibility of cotton to damage by *Heliothrips indicus*, Bagn. (cotton thrips) depends on its health and habit of growth. Of plants raised under identical conditions as regards soil and water, but in varying degrees of shade and shelter, one may be highly susceptible, and the other remain relatively immune; this may possibly be due to differences in the composition of the sap. or texture of the leaves.

Diparopsis castanea, Hmps. (red bollworm), which is originally believed to have had only one generation a year, with probably an occasional incomplete second, now breeds continuously throughout the cotton-growing season in some districts, causing very serious damage. No other food-plant is yet known in the Sudan, but it is thought probable that one exists in the southern provinces, possibly a tree having a seed with a high oil content. In one district, where detailed studies of the life-history have been made, there are 4–5 generations in a season, the first two occupying less than 40 days each, while the later ones occupy at least 60. Pupation takes place in the soil at a depth of 3–5 ins. ; an increasing proportion of individuals of the later generations remains in the soil at a depth of up to 6 ins. until the next season's cotton crop is established. Certain wasps are predacious on the larvae of *D. castanea*, but it is little affected by parasites. The moths were attracted to light traps, except on very moonlight nights, but the majority of females thus caught had already oviposited ; smoke screens did not prove effective in preventing oviposition, and experiments are to be carried out to test the effect of ploughing land that has been under cotton to a depth of 6 ins., shortly after the crop has been cut, to expose the pupae to the heat of the sun.

A brief account is given of observations on *Dysdercus* spp. in the northern rain-cotton belt, where they are essentially associated with the baobab (*Adansonia digitata*) [*R.A.E.*, A, xvi, 156].

NONELL COMAS (J.). **Dos moscas que atacan a los frutos.** *Ceratitis capitata* **(Wied.), mosca de los frutos, y** *Drosophila ampelophila* **(Lw.), mosca o mosquito del vinagre.** [Two Flies injurious to Fruits : the Fruit-fly and the Vinegar Fly.]—*Estac. Pat. veg.*, Divulg. no. 5, 30 pp., 14 figs. Barcelona, 1927.

This circular briefly describes the various stages, biology and control of the Mediterranean fruit-fly, *Ceratitis capitata*, Wied., and of the vinegar fly, *Drosophila melanogaster*, Mg. (*ampelophila*, Lw.), which infests fruits that have been injured by the former.

NONELL COMAS (J.) & BERTRÁN OLIVELLA (A.). **Insectos que causan plaga a los cereales en pleno campo o en el granero.** [Insects harmful to Cereals in the Field or in Granaries.]—*Estac. Pat. veg.*, Divulg. no. 6, 68 pp., 15 figs. Barcelona, 1927.

The chief pests of cereals in the field in Spain are *Mayetiola destructor*, Say ; the Pentatomids, *Aelia rostrata*, Boh., *A. acuminata*, L., and *Eurygaster maura*, L. ; *Agriotes lineatus*, L. ; *Euxoa segetum*, Schiff. ; and *E. tritici*, L. Less common and not usually dangerous pests are *Chlorops taeniopus*, Mg. ; *Oscinella* (*Oscinis*) *frit*, L. ; *Haplothrips aculeatus*, F. ; *Limothrips cerealium*, Hal. ; *Cephus pygmaeus*, L. ; *Zabrus tenebrioides*, Goeze ; and the Pentatomid, *Odontotarsus purpureolineatus*, Rossi. The principal pests of stored cereals are *Calandra granaria*, L., *Tenebroides mauritanicus*, L., *Sitotroga cerealella*, Oliv., and *Tinea granella*, L.

To combat *M. destructor*, sowing should be delayed, wheat or rye should not follow wheat, wheat should be replaced by barley in severely infested areas, stubble should be rapidly cleared, and all possible measures to promote vigorous growth of the plants should be employed. Observations on the bionomics of *A. acuminata* and *A. rostrata* should be made locally, their winter quarters being noted and burnt out. The crop should be quickly cleared and the stubble burnt. In some cases collection of the adults may be worth while. The usual measures against the other pests are recommended.

CANDURA (G. S.). **Insetti, semi e germinazione.** [Insects, Seeds and Germination.]—*Riv. Fis. Mat. Sci. nat.*, (2) ii, pp. 76–84, 4 figs. Naples, 1927.

The status of various insects found in stored seeds is briefly discussed, and illustrated notes are given to enable the presence of different pests and beneficial insects to be recognised.

MALENOTTI (E.). **Contro gli Elateridi nel Basso Piave.** [Work against Elaterids in the Lower Piave Region.]—*Atti Accad. Agric. Sci. Lett. Verona*, (5) iv, pp. 123–154, 9 pls., 25 refs. Verona, 1927.

Wireworms, especially *Agriotes lineatus*, L., are serious pests of cereals, especially maize, in the reclaimed marshlands of the region of the Lower Piave, Venetia. Maize is attacked when the seed is softened by moisture in the ground, and the attack continues within the young plant, causing it to die in 15–20 days. Particulars are given of the morphology and biology of *A. lineatus*, which in North Italy has a life-cycle of nearly three years. One measure that has proved satisfactory consists of raking together, drying and burning the roots and stems of marsh plants, such as *Phragmites communis*, when they are ploughed up. The burning must not be done after a long period of drought or the soil will be impoverished by the destruction of the peaty, organic matter.

The use of kainit does more than repel the larvae ; it drives them down to depths where there are unfavourable conditions, such as low temperature and increased moisture, exposing them to various infections. The author's experiments, which were made in the spring of 1927, were inconclusive as regards infested wheat fields. Spring is not a suitable time for testing potash salts against wireworms in fields of autumn-sown wheat. In maize fields, where the work was preventive in character, the experiments showed that the potash salts must be applied near the plants. When maize is sown in the usual manner by placing the seeds in holes, the seeds will be protected by covering them with a little soil, then putting in the requisite amount of potash, and finally filling up with earth. In recently reclaimed marshland the masses of roots, etc., of marsh plants hinder the action of kainit, which acts by contact, but potassium nitrate, used in the manner described, was effective, though special conditions prevented a conclusive result being reached. In ground reclaimed long previously, kainit at the rate of 10 gm. (about ⅓ oz.) to each plant was effective.

Published work on the use of calcium cyanide is briefly surveyed. In a field that had been reclaimed about twenty years before, a furrow was drawn as close as possible to each row of maize plants, and granular calcium cyanide was discharged into it by means of a special distributor at the rate of 5 oz. to 11 yards. The results showed that calcium cyanide is effective in moist soil, but that in dry soil the furrows must not be exposed to the sun. The best plan is to use an apparatus that will cut the furrow, place the cyanide in it, and then fill it up again.

FAES (H.) & TONDUZ (P.). **Rapport annuel—1926. Station fédérale d'essais viticoles à Lausanne et Domaine de Pully. A. Division de physiologie et pathologie végétale.**—*Annu. agric. Suisse*, xxviii, no. 4, pp. 347–355. Berne, 1927.

Experiments carried out from 1923 to 1925 in the treatment of various soils with carbon bisulphide against *Phylloxera* attacking vines in the canton of Valais showed that a dose of 40 grammes to the square metre, though harmful to the growth of the vine after a dry summer, caused no damage when applied after a wet season. In practice 10 grammes [0·35 oz.] of carbon bisulphide to each plant, applied at the end of November gives satisfactory control. *Clysia ambiguella*, Hb., and *Polychrosis botrana*, Schiff., were less numerous in vineyards in 1926.

The marked increase of *Cheimatobia brumata*, L., in orchards has necessitated the application of two adhesive bands to each tree late in September or early in October, the work being completed by treatment during the winter with 10 per cent. soluble carbolineum, applied between the lower band and the soil. Arsenicals, or soap solutions containing nicotine or liver of sulphur, were successfully used in controlling *Hemerophila* (*Simaethis*) *pariana*, L., which caused russeting of apple foliage.

Other pests of fruit trees included: *Hyponomeuta malinellus*, Zell., and *H. padellus*, L.; *Anthonomus pomorum*, L., and *Eriosoma* (*Schizoneura*) *lanigerum*, Hausm., on apple; and *Contarinia pyrivora*, Riley (*Cecidomyia nigra*, Mg.) and *Phyllobius* sp. on pear.

FAES (H.) & STAEHELIN (M.). **La lutte contre les parasites, insectes et champignons de la vigne en 1925 et 1926.**—*Annu. Agric. Suisse*, xxviii, no. 4, pp. 373–396, 2 figs. Berne, 1927.

Although very abundant in 1925, *Clysia ambiguella*, Hb., and *Polychrosis botrana*, Schiff., appeared only in small numbers in 1926, the first flight of the moths, which began about 6th April and extended with some interruptions until 10th June, being comparatively slight. Although the moths of the second flight, which began in mid-July and reached its height between 20th July and 7th August, were more numerous, few grapes were attacked by the larvae in autumn, the dry heat in August and September having probably prevented a certain proportion of the eggs from hatching.

Traps placed in vines attacked by *C. ambiguella* and *P. botrana* should be used for the purpose of observing the flight of the first and second generations. The sprays recommended for application to the fruit only, as soon as the main flight of the first generation is ended, are 2 lb. Paris green, 10–20 lb. lead or calcium arsenate, or 10 lb. nicotine, titrated at 15 per cent., to 100 gals. Bordeaux mixture. Treatments should be repeated at an interval of 8–10 days. When the larvae reach a more advanced stage, a solution of pyrethrum soap is the most effective means of control. In the case of the second generation the Bordeaux-nicotine spray should be applied, to the fruit only, 6 to 8 days after the main flight. The results secured with a dust composed of 95 per cent. quicklime and 5 per cent. calcium carbide were good, but inferior to those obtained with sprays.

Grassé (P. P.). **Les cochenilles de la vigne.**—*Prog. agric. vitic.*, lxxxviii, no. 49, pp. 543–549, 1 pl. Montpellier, 4th December 1927.

A list is given of 19 species of Coccids occurring on vines in France, with notes on some of the essentially vine-feeding species, all of which have been previously noticed [*R.A.E.*, A, viii, 212].

Pussard (R.). **A propos du régime alimentaire du perce-oreille** *Forficula auricularia*, **L. (Dermaptère).**—*Bull. Soc. Sci. nat. Rouen*, 1925, pp. 7–13, 7 refs. Rouen, October 1925. [Recd. 1927.]

Laboratory observations at Rouen in 1924 indicated that while *Forficula auricularia*, L., accepts as food the leaves of *Pelargonium*, lilac and rose, when larvae of *Gracilaria syringella*, F., are present on lilac foliage, they are consumed and the leaves left untouched. It may thus be concluded that when the earwigs are found in rolled lilac leaves they have merely consumed the larvae that caused the injury to the foliage. They also attacked pupae of *G. syringella* and larvae of *Pieris brassicae*, L. (when quite small) and of *Pyralis farinalis*, L., but would not feed on pupae of *P. farinalis*.

Schenk (P. J.). **Plagen bei het forceeren van heesters.** [Pests of Hot-house Shrubs.]—*Floralia*, xlviii, no. 47, pp. 748–749, 3 figs. Assen, 25th November 1927.

About 90 per cent. of the plants of *Azalea indica* in Holland are imported in autumn from Belgium, and in the winter of 1926–27 the azalea moth [*Gracilaria azaleella*, Brants.] infested these plants to a considerable extent. The whitefly [*Trialeurodes vaporariorum*, Westw.] has also recently been found on Belgian azaleas.

Sprossmann (—). **Verstärktes Auftreten des Fichtennestwicklers** (*Grapholitha tedella*, **Cl.**). [Increase of *G. tedella*.]—*Forstarch.*, ii, 1926, p. 70. (Abstract in *Neuheiten PflSch.*, 1927, no. 4, p. 111. Vienna, December 1927.)

An increase of the Tortricid, *Epiblema* (*Grapholitha*) *tedella*, Cl., is recorded in the Harz mountains and around Treves, where it attacks the needles of the lower and middle branches of 40–60-year-old spruce at the edges of forests at altitudes over 1,500 ft.

Šámal (J.). *Grapholitha woeberiana*, **Schiff.**—*Vešt. čsl. Akad. zeměd.*, ii, pp. 98–100. Prague, 1926. (Abstract in *Neuheiten PflSch.*, 1927, no. 4, p. 111. Vienna, December 1927.)

The Tortricid, *Enarmonia* (*Grapholitha*) *woeberiana*, Schiff., abounds in and around Prague, especially on cherry and *Prunus mahaleb*. The eggs are laid in cracks in the trunks, and the larvae mine beneath the bark, preparing chambers for the pupae. There are two generations a year, the moths appearing at the end of March and at the end of July. Hibernation occurs in the larval stage. Large pupal chambers should be cut out and the wound dressed twice with a mixture of tar and asphalt. Badly infested trees should be destroyed.

FRÖHLICH (J.). **Der Borkenkäfer im bosnischen Walde.** [Bark-beetles in Bosnian Forests.]—*Wiener allg. Forst- u. Jagdztg.*, xliv, p. 101, 1926. (Abstract in *Neuheiten PflSch.*, 1927, no. 4, p. 115. Vienna, December 1927.)

The Scolytids dealt with include *Ips typographus*, L., which destroys 25 per cent. of the spruce stands in north-western Bosnia, where all felled trees are allowed to lie unbarked ; *I.* (*Tomicus*) *curvidens*, Germ., which breeds in great numbers in silver firs [*Abies*] that are dying from other causes ; and *I. sexdentatus*, Boern., *I. acuminatus*, Gyll., and *Pityogenes bidentatus*, Hbst., which infest Scots pines [*Pinus sylvestris*] so severely that they die in groups, but do not occur in black pine [*P. laricio*]. *Myelophilus* spp. do not do noticeable harm in pine stands.

OBENBERGER (J.). *Agrilus communis mokrzeckii* **n. ssp., nebst Bemerkungen über die Agrilen der** *viridis*-**Gruppe (Col., Buprestidae).** [*A. communis mokrzeckii*, subsp. n, with Observations on the *viridis* Group.]—*Ann. zool. Mus. polon. Hist. nat.*, vi, no. 3, pp. 195–250, 2 pls., 2 figs. Warsaw, 1st November 1927.

Agrilus communis mokrzeckii, subsp. n., is described from rose trees in Bulgaria. A key is given to the Central European species and varieties of *Agrilus* allied to *A. viridis*, L., with notes on synonymy, geographical distribution and biology.

[POSPELOV (V. P.).] **Поспелов (В. П.). Flacherie (Septicaemia) of the Larvae of** *Agrotis segetum*, **Schiff.** [*In Russian.*]—*Rep. Bur. Appl. Ent.*, iii, no. 1, pp. 1–23, 1 pl., 35 refs. Leningrad, 1927. (With a Summary in English.)

During 1925–26 larvae of *Euxoa* (*Agrotis*) *segetum*, Schiff., in Russia were found to be killed by a bacterial disease. It was a mixed infection, including *Bacillus agrotidis typhoides*, sp. n. The effect on Lepidopterous larvae under experimental conditions, both of the individual and mixed infections, is discussed, and the work of previous authors on bacterial diseases of insects is reviewed.

[VOĬNOVSKAYA-KRIGER (T.).] **Войновская-Кригер (Т.). On the Biology of** *Nemeritis canescens*, **Grav. (Hymenoptera, Ichneumonidae)—Parasite of** *Ephestia kühniella*, **Zell.** [*In Russian.*]—*Rep. Bur. Appl. Ent.*, iii, no. 1, pp. 24–35, 10 figs., 25 refs. Leningrad, 1927. (With a Summary in German.)

A detailed account is given of the anatomy of the various stages of the Ichneumonid, *Nemeritis canescens*, Grav., which has been bred successfully from *Ephestia kühniella*, Zell., under laboratory conditions. Males have never been found, reproduction being parthenogenetic, and the absence of the receptaculum seminis suggests that either males do not exist at all or are very rare. The middle stage larvae of the host are preferred by the parasite ; under natural conditions young larvae were never found to be attacked, and when the old ones were parasitised it did not prevent their pupating and reaching the adult stage. The method of parasitism is described [*R.A.E.*, A, viii, 544] ; it occurs through the web spun by the host larvae, those outside the web being less suitable for infestation owing to their slippery surface. As a rule only one egg is deposited in each larva. The life-cycle from egg to adult varies from 18 to 34 days, with an average of 23, at a temperature of 20–25° C. [68–77° F.]. Pupation occurs within the web of the host, or in the case of parasitism of older larvae, within the host pupa. As many as 15 generations occur under natural conditions during the year. This parasite is considered to be suitable for propagation and liberation in flour stores for the control of *E. kühniella.*

The Chalcid, *Lariophagus distinguendus*, Först., was reared from 7 per cent. of the larvae and pupae of *E. kühniella* parasitised by *N. canescens.*

[POSPELOV (V. P.), SAL'DAU (P. Ya.), PETROV (A. D.) & ISACHENKO (V. B.).] **Поспелов (В. П.), Сальдау (П. Я.), Петров (А. Д.) и Исаченко (В. Б.). Experimental Disinfection of Grain and Flour with Chloropicrin and other volatile Substances.** [*In Russian.*]—*Rep. Bur. Appl. Ent.*, iii, no. 1, pp. 36–54, 2 figs., 18 refs. Leningrad, 1927. (With a Summary in German.) Also abridged in *Ann. Inst. Exp. Agron.*, v, no. 2–3, pp. 159–161, 1 fig., 1 ref. Leningrad, 1927.

Previous work on the fumigation of grain for the control of insect pests is reviewed. Laboratory experiments were made to compare the efficacy of chloropicrin, ethyl acetate with carbon tetrachloride, and carbon bisulphide, the last being used as a standard. The toxicity of ethyl acetate with carbon tetrachloride is similar to that of carbon bisulphide for the control of *Bruchus* (*Pachymerus*) *chinensis*, L., but the mixture is less effective against *Calandra granaria*, L., and *Tyroglyphus* (*Aleurobius*) *farinae*, DeG. It is more expensive than carbon bisulphide and not practical for general use. Chloropicrin is about 8–10 times as effective as carbon bisulphide against all three species, but as it penetrates very slowly through stacked grain, if placed in containers, it appears best to distribute it throughout the grain by spraying, etc. It has no effect on the germination of leguminous seeds and even stimulates the germination of oats, but that of wheat and rye is reduced.

The practical application of chloropicrin, which alone is described in the second paper, was tested in rooms containing packets of pulses infested by *B. chinensis*. The chloropicrin was poured into a number of containers, the depth of the liquid being about 0·1 in. Though ½ oz. to each 100 cu. ft. proved effective under laboratory conditions, double this concentration was used owing to the crowded condition of the rooms. In 96 hours at 14° C. [47·2° F.] the chloropicrin had all evaporated, and all stages of the Bruchid were dead. By the end of the day the room could be entered without any protection against the gas. The germination of the seed had apparently not been affected.

[FATEEVA (A. M.).] **Фатеева (А. М.). Observations on the Biology of** *Hylobius abietis*, **L., and Experiments on its Control.** [*In Russian.*]—*Rep. Bur. Appl. Ent.*, iii, no. 1, pp. 55–65, 20 refs. Leningrad, 1927. (With a Summary in English.)

Previous literature on the biology of *Hylobius abietis*, L., in different parts of the world is reviewed. The author's observations were made in northern Russia during 1923–1927. Near Leningrad the life-cycle occupies two years. The overwintering adults lay their eggs from May to August, usually on the stumps of felled trees and their roots.

The larvae begin to hatch in June and tunnel along the roots, feeding until the autumn. They have been found in trap poles at a depth of over 6 feet. They hibernate in a special chamber made in the wood in September or October; the following June or July they pupate, and 2–3 weeks later the adults emerge and feed on the young pines until the autumn. Eggs are not laid on the logs lying on the surface of the ground, though the adults feed on these. The adults live 3 years and continue oviposition, provided that pairing is repeated.

Trap poles, about 7 feet long and 8–10 inches in circumference, were placed in the ground sloping at an angle of 40–45°, in the clearings and in the pine forest on 20th May 1925. When examined at different times during 1926 they were all infested. Though so far only tried on a small scale, this method should prove of value in destroying the weevils. The infested poles should be burnt. The adults can be trapped in ditches to which they are apparently attracted; in the experiments these were about 260 ft. long and 20 ins. deep. An average of 603 individuals were caught by this means during a week. It is suggested that stumps might be left as traps until the autumn and then uprooted, about 10–20 being sufficient for about 3 acres.

[KREĬTER (E. A.).] **Крейтер (Е. А.). Contribution to the Biology of the Barley Fly,** *Hydrellia griseola*, **Fall.** [*In Russian.*]—*Rep. Bur. Appl. Ent.*, iii, no. 1, pp. 92–98, 5 figs., 3 refs. Leningrad, 1927. (With a Summary in German.)

Owing to the humid conditions during 1923, *Hydrellia griseola*, Fall., was particularly abundant in the government of Leningrad. Barley, wheat and oats are equally attacked, though a definite preference is shown for plants 17–21 days old. The eggs are laid on either side of the leaf or on the stem. They hatch in 5–6 days, and the larvae begin mining the leaves at once. Their attack does not seriously affect the plants, and they continue to produce fresh leaves and a normal crop. When, however, the very young plants of the later sown crops are attacked, they usually succumb. The larvae are full-grown in 2–3 weeks, pupation occurring in the leaf and the adults emerging about 2 weeks later. The various stages are described. The first adults were noticed in 1923 towards the end of May, and the maximum oviposition about 12th June. During the second half of July, a second flight of adults occurred, lasting until the end of August. This generation of flies either does not oviposit the same year or else lays its eggs on wild Gramineae. Neither eggs nor larvae of the new generation could be discovered on cultivated plants. The winter apparently may be passed either as a pupa or an adult. The undeveloped sexual organs of adults examined in the autumn suggests that these do not oviposit until the following spring; on the other hand, the late appearance of the adults in the spring suggests that the winter is passed in the pupal stage.

[SHUL'GINA (O. G.) & KALINICHEV (P. A.).] **Шульгина (О. Г.) и Калиничев (П. А.). Experimental Infection of** *Locusta migratoria*, **L., with Bacterial Disease.** [*In Russian.*]—*Rep. Bur. Appl. Ent.*, iii, no. 1, pp. 99–104, 2 refs. Leningrad, 1927. (With a Summary in English.)

The following is taken from the authors' summary: In the experiments described *Locusta migratoria*, L., was infected with a culture of *Bacillus acridiorum* and with a mixed culture of bacilli obtained from larvae that died in the laboratory during breeding at low temperature and containing *B. fluorescens liquefaciens*, *B. punctatus* and *B. acridiorum*. The best results (90 per cent. mortality) were obtained with infection of the larvae *per os* with *B. acridiorum* at a temperature alternating from 12·5 to 23·5 C. [54·5–74·3° F.]. The same culture at a constant temperature of 33–35° C. [91·4–95° F.] gave only 10 per cent. mortality. The mixed culture also gave a low mortality.

[TROITZKIĬ (N. N.).] **Троицкий (Н. Н.). The *Phylloxera* Problem in U.S.S.R. and its Solution. Programme for the Study of *Phylloxera* and Resistant Stock.** [*In Russian.*]—*Ann. Inst. Expt. Agron.*, v, no. 2–3, pp. 137–147, 7 refs. Leningrad, 1927.

Phylloxera vastatrix, Planch., is widely distributed on vines in southern Russia, including Transcaucasia, where it causes considerable damage. The importance of studying its exact distribution and the value of resistant stocks under local conditions is pointed out, and a programme for work throughout the infested area is outlined.

[MORDVILKO (A.).] **Мордвилко (А.). *Phylloxera* Investigations. Programme of Biological Investigations.** [*In Russian.*]—*Ann. Inst. Exp. Agron.*, v, no. 2–3, pp. 148–156, 2 refs. Leningrad, 1927.

A general programme for the study of *Phylloxera* in Russia is outlined, and the various points in its biology requiring investigation are discussed. It has not yet been recorded from Turkestan, where the soil is extremely light, and it is possible that the fine particles may either close the spiracles of the Aphid or prevent attack by adhering closely to the roots of the vine. Various methods that might be tried in order to prevent the Aphids that crawl on the soil surface from penetrating to the roots are briefly enumerated.

[KREĬTER (E. A.).] **Крейтер (Е. А.). Some Observations on *Elachiptera cornuta*, Fall. Preliminary Paper.** [*In Russian.*]—*Ann. Inst. Exp. Agron.*, v, no. 4, pp. 287–292, 3 figs., 2 refs. Leningrad, 1927.

It is believed that a great deal of the damage ascribed to *Oscinella frit*, L., is due to other insect pests. During 1926, towards the end of July, which is the period when the chief damage is done by this fly, about one-third of the injured and dead barley plants near Leningrad were found to be infested by *Crassiseta* (*Elachiptera*) *cornuta*, Fall. The injury caused by the two species is very similar, but *C. cornuta* will also attack older plants, when the injury resembles that done by *Chlorops*. Newly hatched larvae of *C. cornuta* were first found on 19th May on autumn-sown barley ; adults were present at the same time, and larvae were also found on the spring-sown barley as soon as it appeared. Hibernation apparently occurs in the adult stage, the eggs being laid in the spring on the young shoots of the plants. Under laboratory conditions the adults of the first generation appeared on 29th June and those of the second on 30th July. The larval stage lasted 3–4 weeks, and the pupal stage 1–2. The adults that emerged at the end of June reproduced within a week, but the sexual organs of those emerging at the end of July were still undeveloped in September. The various stages are described.

[STANCHINSKIĬ (V. V.).] **Станчинский (В. В.). On the Question of Injury to Cereals by Insects and Diseases in the Smolensk Government.** [*In Russian.*]—*Ekon. Zhizn'* [*Econ. Life*], 1927, no. 3–4, pp. 25–34. Smolensk, 1927.

During the first year (1926) of the activities of the Smolensk Station for the Protection of Plants, a survey was made of the pests attacking cereals, chiefly by taking samples in various localities.

The 1,977 stems examined were found to be infested with some 9 different insect pests. Of these *Contarinia tritici*, Kirby (wheat midge) was particularly abundant, and owing to the continued drought in July pupation occurred in the ears. The loss caused by this pest amounted to 240 lb. of grain to the acre. *Trachea* (*Hadena*) *basilinea*, F., also caused considerable injury, which was not confined to standing crops, but continued in the sheaves and the stored grain. Rye was very heavily infested. *Oscinella* (*Oscinis*) *frit*, L., attacks rye during the stem-producing stage, and provided that a free tillering variety is sown, very little actual damage is caused. It also attacks autumn-sown wheat and spring-sown barley and oats. On the whole, autumn-sown crops suffered less from insect attack than those sown in the spring.

[RAKHMANINOV (A. N.).] **Рахманинов (А. Н.). Short Review of the Activities of the Entomological Department, 1922-1925.** [*In Russian.*]—*Khar'kovs. Oblast. Sel.-Khoz. Opuitn. Stantz.* [*Kharkov Regional Agric. Exp. Sta.*], Ent. Otd. no. 5, 51 pp., 2 pls., 12 refs. Kharkov, 1926.

One of the more important pests studied in the Ukraine during the period under review was *Mayetiola destructor*, Say, a more detailed account of which is given in the succeeding paper. Information concerning *Anisoplia austriaca*, Hbst., has been compiled by G. M. Yaroslavtzev. Observations under experimental conditions show that autumn-sown wheat and spring-sown soft varieties do not suffer to any great extent, but of the hard varieties as much as 40 per cent. may be injured. This is contrary to statements in the literature, but in the Ukraine the hard varieties sown in the spring are not abundant and owing to their protracted development may act as trap crops on which the beetles collect towards the end of their life. Most of the grain is only partly eaten.

Cephus pygmaeus, L., is a common pest of cereals, occurring most abundantly on autumn-sown wheat and rye and more rarely on spring-sown wheat or barley. It is particularly rare on hard varieties of wheat, while oats are not attacked. It does not cause very serious injury, probably owing to the local practice of sowing a large percentage of oats, and to the abundance of the parasite, *Collyria calcitrator*, Grav. Moisture conditions apparently affect the resistance of the plants to attack. *Trachelus tabidus*, F., though not recorded from the more northerly regions of the Ukraine, is as common as *C. pygmaeus* in the southern areas.

Chlorops taeniopus, Mg., has gradually been decreasing, but under certain conditions, such as lack of humidity, it is capable of causing considerable injury to various cereal crops. The appearance and reaction of the attacked plants is described. The infested stems of autumn-sown crops do not die until the spring, and the plants continue to grow. Spring injury to autumn-sown rye has not been observed. Both autumn- and spring-sown wheat and spring-sown barley are attacked in the spring.

The information concerning *Meromyza nigriventris*, Mg., has been compiled by E. V. Klokov. Owing to the dry climatic conditions, this Chloropid is not usually a serious pest, though it appeared in unusual abundance in 1923. The larvae hibernate in self-sown plants. Adults appeared at the beginning of May, and towards the end of the month eggs were found, mainly on the leaves of autumn-sown wheat, though a few also occurred on spring-sown wheat and barley. A second flight of adults occurred towards the end of June. These individuals laid eggs in August after an interval of about a month, and oviposition continued throughout most of September. The injury to the very young plants of wheat, rye, barley and oats is similar to that caused by *Oscinella frit*, L. When older plants are attacked a condition of white-ear is produced in rye, wheat and barley; this type of injury does not appear to have been recorded before.

Insect Pests in 1926. [*In Russian.*]—*Khar'kovs. Oblast. Sel.-Khoz. Opuitn. Stantz.* [*Kharkov Regional Agric. Exp. Sta.*], Ent. Otd. no. 7, 63 pp., 2 pls., 8 refs. Kharkov, 1927.

In this report on insect pests in the Ukraine in 1926, a section by E. V. Klokov is devoted to locusts, which were not very prevalent, owing to the predominance of the fungus, *Entomophthora grylli*, during the preceding year. *Calliptamus italicus*, L., was much less abundant than usual, and is not expected to be of economic importance for some years to come. Other species recorded are *Myrmeleotettix antennatus*, Fieb., *Sphingonotus coerulans*, L., *Dociostaurus crucigerus brevicollis*, Ev., *Oedipoda coerulescens*, L., *Oedalus decorus*, Germ., *Chorthippus* (*Stauroderus*) *bicolor*, L., *C.* (*S.*) *biguttulus*, L., *C.* (*S.*) *mollis*, Charp., *Celes variabilis*, Pall., and *Arcyptera microptera*, F. W.

Natural enemies of locusts recorded in 1925 were *Epicauta erythrocephala*, Pall., *Mylabris variabilis*, Pall., *M. floralis*, Pall., *M. quatuorpunctata* var. *adamsi*, Fisch., *M. geminata*, F., and *Trombidium* sp. Owing to the decrease of locusts in 1926, the parasites were also less numerous, only *M. variabilis* and *M. floralis* being found in small numbers.

Observations on cutworms are recorded by G. M. Yaroslavtzev and A. I. Solov'eva. *Agrotis ypsilon*, Rott., which had been abundant in the autumn of 1925, was rare in 1926. *Feltia exclamationis*, L., is so scarce in the autumn that it is not considered likely to be a serious pest of autumn-sown crops. The local distribution and seasonal history of *Euxoa segetum*, Schiff., is discussed. It is particularly injurious to beet, but in some localities also attacked millet and potatoes. About 25–30 per cent. of the larvae and pupae were parasitised by *Amblyteles vadatorius*, Ill., *Amicroplus* (*Macrocentrus*) *collaris*, Spin., and the Tachinid, *Cnephalia hebes*, Fall., the last two being the most important.

The local seasonal history of *Anisoplia austriaca*, Hbst., has been studied by E. V. Klokov. The worst damage is caused to spring-sown wheat, though in some localities autumn-sown crops are considerably attacked. Spring-sown barley is attacked to some extent, but the injury to oats is negligible.

A general survey of the pests of field crops is given by G. M. Yaroslavtzev and A. I. Novinenko. In the spring *Mayetiola destructor*, Say, is the most important pest of autumn-sown cereals. During 1926, there were three generations, occurring approximately from the end of April to the end of May, from the end of June to the middle of July, and from the beginning to the end of September. Many of the larvae and pupae of the second and third generation were parasitised, mainly by *Platygaster minutula*, D.T. (*minutus*, Lind.). Of the spring-sown crops the soft varieties of wheat suffer most, the hard varieties and barley to a less extent, and oats least of all. The importance of injury to spring-sown wheat may be judged by the number of stems, particularly primary ones, attacked and their condition. Under local conditions the primary stems usually succumb without forming ears. The injury to these was considerably less in 1926 than in the previous year ; in some places this was due to the late appearance of the adults of the spring generation, while in others the plants were more resistant owing to their early development. *Oscinella frit*, L., attacks all spring-sown crops, particularly barley and oats ; the amount of injury varies in different localities and is of less importance than that done by *M. destructor*. Notes are also given on a number of the usual pests attacking other field crops such as beet and forage.

Notes on the pests of vegetable crops, by M. Ya. Bondarovich, include an extensive list showing the food-plants, type and time of injury and economic importance.

Other papers are : The Pests of Fruit Trees, by N. S. Kamuishnuiĭ and A. I. Solov'eva ; The Entomofauna of the Soil, by N. A. Reshetilova ; and *Eumerus strigatus*, Fall. (*E. lunulatus*, Mg.), by G. M. Yaroslavtzev. Though *E. strigatus* is widely distributed in the Ukraine as a pest of onions, very little is known about its life-history under local conditions. The type of injury is described ; in August and September larvae were also found infesting potato tubers and the roots of carrot and parsley.

[RAKHMANINOV (A. N.).] **Рахманинов (А. Н.). Material for the Study of Autumn Injury by the Hessian Fly.** [*In Russian.*]—*Khar'kovs. Oblast. Sel.-Khoz. Opuitn. Stantz.* [*Kharkov Regional Agric. Exp. Sta.*], Ent. Otd. no. 6, 29 pp., 6 figs., 2 refs. Kharkov, 1927.

The observations on the injury by *Mayetiola destructor*, Say (Hessian fly) to various cereal crops in the Ukraine, and the reaction of the plants to it [*R.A.E.*, A, xiv, 318] have been continued in 1925 and 1926 with similar results. The unusually wet summer and early autumn of 1925 increased the resistance of the plants. Experiments have proved that the use of manures and the amount of moisture have a decided effect in increasing their resistance.

[Chorbadzhiev (P.).] **Чорбаджиевъ (П.). Pests of Cultivated Plants in Bulgaria during 1925.** [*In Bulgarian.*]—*Rapp. ann. Sta. agron. Etat Sofia,* 1925, pp. 218–256. Sofia, 1927. (With a Summary in German.)

Of the 194 insect pests recorded during the year the more important include *Tetraneura ulmifoliae,* Baker (*ulmi,* DeG.), on the roots of maize, *Thaumetopoea pityocampa,* Schiff., on pines, *Phytodecta sexpunctata,* Panz., on lucerne, and *Anisoplia austriaca,* Hbst., and *A. segetum,* Hbst., on ears of rye, barley and wheat.

Otiorrhynchus turca, Boh., was abundant on leaves and shoots of vines; *Phyllobius pilicornis,* Desbr., occurred on leaves of young nut trees; *Scolytus amygdali,* Guér., was abundant on peaches and plums; and *Eurytoma amygdali,* End., attacked almonds.

Sachtleben (H.). **Beiträge zur Naturgeschichte der Forleule,** *Panolis flammea* **Schiff. (Noct. Lep.), und ihrer Parasiten.** [Contributions to the Life-history of the Pine Moth, *P. flammea,* and its Parasites.] —*Arb. biol. Reichsanst.,* xv, no. 4, pp. 437–536, 3 figs., 3 pls., numerous refs. Berlin, December 1927.

The investigations described were undertaken as a result of an outbreak of *Panolis flammea,* Schiff., in wide tracts of North and East Germany, which began in 1922 and reached its maximum in 1924. The work was done in 1925 in the State forest of Zossen and in the laboratory. The flight of the moths usually begins at the end of March, and decreases steadily during May, though it may sometimes extend to early June. The eggs are laid singly or in rows, one female laying about 500, and hatch in 9–27 days. In captivity, besides *Pinus sylvestris* and *P. strobus,* the larvae also fed on *P. laricio, P. montana, P. banksiana* and *Larix europaea.* Until the first moult the larva cannot feed on the previous year's needles, so that the development of the May shoots is of great importance in the development of an outbreak. Some of the young larvae can, however, mine young pine-buds. The mature larva makes a pupal case of débris spun together.

The main part of the paper deals with the parasites and hyperparasites of *P. flammea* observed in 1925 at Zossen from the systematic, morphological and biological aspects. They include the Tachinids, *Echinomyia magnicornis,* Zett., *Ernestia rudis,* Fall., and *Winthemia amoena,* Mg.; the Ichneumonids, *Banchus femoralis,* Thoms., *Henicospilus merdarius,* Grav., *Ichneumon pachymerus,* Htg., *Aphanistes armatus,* Wesm., *Exochilum circumflexum,* L., *Cryptus dianae,* Grav., *Ichneumon bilunulatus,* Grav., *I. comitator,* L., and *I. nigritarsis,* Grav.; the Braconid, *Meteorus* sp.; and the Chalcids, *Trichogramma evanescens,* Westw., which parasitised about one-fifth of the eggs of *P. flammea,* and *Pteromalus alboannulatus,* Ratz., which oviposits in the pupa, development from egg to adult requiring 25–39 days, and which also infests *Bupalus piniarius,* L., and *Sphinx pinastri,* L.

Parasites of *P. flammea* that were noticed, but not bred, were the Bombyliid, *Anthrax hottentottus,* L., and the Braconid, *Microplitis decipiens,* Prell. The hyperparasites, *Anthrax morio,* L. (from *E. rudis, E. magnicornis* and *B. femoralis*), *A. maurus,* L. (from *E. rudis*) and *Microcryptus basizonus,* Grav. (from *B. femoralis*), were so few in number as to be negligible. From the point of view of biological control the two Chalcids are the chief species meriting attention, and are easy to maintain by breeding, but the steady decrease of the caterpillars of *P. flammea* and their complete disappearance towards the end of July 1925 were due to the large number of parasites of the larvae.

The raking together of forest litter is not effective, as both *P. flammea* and its parasites can emerge from a depth of 3 feet. Preparations of calcium arsenate and sodium fluosilicate proved satisfactory as dusts, while a proprietary contact dust also gave good results. Dusts should be useful against the early stages especially, as the resinous surface of the May shoots holds them well. As *T. evanescens* and *P. alboannulatus* parasitise the egg and pupa respectively, they are not affected by these insecticides.

SCHMIDT (M.). **Marienkäfer** (*Subcoccinella 24-punctata* **L.**) **als Nelkenschädling.** [Ladybird Beetles, *S. vigintiquatuorpunctata*, as Pests of Carnations.]—*Blumen- u. Pflanzenbau*, 1927, pp. 83–85, 2 figs. (Abstract in *Z. Pfl Krankh.*, xxxviii, no. 1–2, p. 59. Stuttgart, 1928.)

The Coccinellid, *Subcoccinella vigintiquatuorpunctata*, L., has been recorded in various parts of Germany of recent years as attacking the leaves of carnations in greenhouses.

LANDGRAF (T.). *Chaerocampa elpenor* **L., der mittlere Weinschwärmer, ein Familienschädling der Oenotheraceen.** [*Pergesa elpenor*, a Pest of the Oenotheraceae.]—*Die kranke Pflanze*, iv, no. 11, pp. 166–167, 1 pl. Dresden, November 1927.

The Sphingid, *Pergesa* (*Chaerocampa*) *elpenor*, L., injured *Fuchsia* in the immediate neighbourhood of Hamburg in 1927. In breeding experiments larvae reared on *Fuchsia* preferred the buds and leaves of that plant to those of wild and cultivated grape-vines.

GESCHER (C.). **Zur Reblauskunde und Reblausbekämpfung.** [A Contribution to the Knowledge and Control of *Phylloxera*.]—*Die kranke Pflanze*, iv, no. 11, pp. 167–172. Dresden, November 1927.

Further study of the biology of *Phylloxera* is essential, in view of the unsatisfactory results of the present methods of controlling it. Though the author agrees that it is possible for a colony to be maintained for a considerable time on the roots of vines by continuous parthenogenetic reproduction, he considers that eventually it is essential for it to be regenerated by migration to the roots of forms that are the result of sexual reproduction on the aerial parts of the plant. If this is so, a better opportunity for control is afforded.

HARBACH (—). [**Work against the Beech Scale and the Woolly Aphis.**]—*Dts. Forstztg.*, xlii, no. 36, 9th September 1927. (Abstract in *Tijdschr. Plantenziekt.*, xxxiii, no. 12, pp. 331–332. Amsterdam, December 1927.)

In December, January and February in Germany the beech scale [*Cryptococcus fagi*, Bär.] and the woolly apple aphis [*Eriosoma lanigerum*, Hsm.] may be combated by brushing the trees with a mixture made by adding 5 per cent. of water-soluble fruit-tree carbolineum to freshly slaked lime, with sufficient water to enable the material to be painted on.

Meier (K.). **Ueber die Wirkung der Winter- und Sommerspritzung auf das Auftreten des Frostspanners. Ueber die Wirksamkeit von Bleiarseniat und Kalkarseniat.** [The Effect of Winter and Summer Sprayings on the Occurrence of the Winter Moth. The Efficiency of Lead Arsenate and Calcium Arsenate.]—*Schweiz. Z. Obst.-u. Weinb.*, xxxvi, no. 26, pp. 452–457, 1 chart. Wädenswil, 24th December 1927.

Counts of the winter moth [*Cheimatobia brumata*] on adhesive banding on sprayed and unsprayed apple trees showed a definite decrease in its numbers as a result of three or four dormant sprays in winter followed by a lime-sulphur and arsenical spray in summer. A similar decrease, however, was produced on cherry trees by the dormant sprays alone.

A series of tests showed calcium arsenate to be sufficiently effective against the codling moth [*Cydia pomonella*] to warrant its employment in place of lead arsenate.

Erni (W.). **Winter- und Sommerspritzversuche an Feld- und Zwergobstbäumen auf der Gutswirtschaft der landwirtschaftlichen Schule Schwand-Münsingen.** [Winter and Summer Spraying Experiments on Field and Dwarf Fruit Trees on the Farm of the Schwand-Münsingen Agricultural School.]—*Schweiz. Z. Obst.- u. Weinb.*, xxxvi, no. 26, pp. 464–498, 23 figs. Wädenswil, 24th December 1927.

These experiments on the routine spraying of fruit trees against insects and fungi showed that the addition of 2 per cent. lead arsenate to the lime-sulphur spray applied after blossoming affords a satisfactory control of the codling moth [*Cydia pomonella*]. A scarcity of the apple blossom weevil [*Anthonomus pomorum*] may have been due to the cleansing effect of winter spraying depriving it of suitable winter-quarters and shelter from birds.

[Trägårdh (I.).] **Skadegörelse av Husbocken** (*Hylotrupes bajulus*) **i Danmark.** [Damage caused by *Hylotrupes bajulus* in Denmark.] —*Ent. Tidskr.*, xlviii, no. 3, p. 142. Stockholm, 1927.

During recent years a serious increase has occurred in the damage caused by *Hylotrupes bajulus*, L., in Denmark. The larvae bore into seasoned timber of pine or spruce, their development taking from 2 to 8 years, in the course of which time the entire inner portion of the wood may be reduced to powder, without any damage being visible until the exit holes of the adults appear. Beams supporting the roofs of various buildings have been found to be attacked, preference being shown for those having slate roofs, which absorb the heat more quickly in summer than thatch or tiles.

v. BUTOVITSCH (V.). *Scolytus triarmatus* **Eggers. En för Sverige ny barkborre.** [*Scolytus triarmatus*, Eggers, a Bark-borer new to Sweden.]—*Ent. Tidskr.*, xlviii, no. 3, p. 170. Stockholm, 1927.

Scolytus triarmatus, Eggers, is recorded from Sweden, where it was discovered in a withered elm. The morphology of this species is briefly described and compared with that of *S. scolytus*, F., with which it was previously supposed to be identical.

BRITON-JONES (H. R.) & LEES (A. H.). **The correct Time for Application of Spraying Fluids.**—*J. Minist. Agric.*, xxxiv, no. 9, pp. 814–817, 8 pls. London, December 1927.

An attempt is made to define more closely the times at which sprays employed against pests of fruit should be applied, the stages, which are illustrated by photographs, being termed dormant, swelling, bursting, burst, green flower and pre-flowering, or, in the case of apple, pink. Tables are given indicating the suitable sprays for application at each stage to apple, black-currant, cherry, gooseberry, peach, pear and plum.

THOMPSON (W. R.) & PARKER (H. L.). **Etudes sur la biologie des insectes parasites : La vie parasitaire et la notion morphologique de l'adaptation.**—*Ann. Soc. ent. Fr.*, xcvi, pt. 2, pp. 113–146, 13 refs. Paris, 1927.

In this study of the biology of Hymenopterous parasites, the authors develop the theory that their structure has gradually become adapted to the parasitic mode of life, and discuss the relations existing between their structure and function, both in the adult and larval stages, indicating the extent to which this morphological adaptation has advanced in particular cases. The conclusion is arrived at that correspondence between form and function in these parasites is neither constant nor essential, though it may exist in many cases.

STELLWAAG (F.). **Aus dem Arbeitsgebiet der R. Stazione di Entomologia in Florenz und anderer Stationen für Schädlingsbekämpfung in Oberitalien.** [Notes on the Sphere of Work of the State Entomological Station in Florence and other Stations for combating Pests in North Italy.]—*Anz. Schädlingsk.*, iii, no. 12, pp. 139–146, 6 figs. Berlin, 15th December 1927.

This is a general survey of the manner in which the Italian State institutions handle problems of agricultural entomology in North Italy, especially in the district served by the station at Florence directed by Berlese. No other European country is considered to have achieved such successes with biological control.

Legislación fitopatológica.—*Bol. Pat. veg. Ent. agríc.*, ii, no. 5–7, pp. 61–73. Madrid, September 1927.

Decrees and orders, all of 1927, are reproduced, which deal with the reorganisation of the Spanish phytopathological service, the inspection of exported oranges, the reorganisation of the forest pest service, the inspection of exported plants, and the inspection of crops.

Arróniz (C.) & Ordoñez (E.). **Datos económicos sobre la lucha contra la mosca de la aceituna.** [Economic Data on Work against the Olive Fly.]—*Bol. Pat. veg. Ent. agríc.*, ii, no. 5–7, pp. 23–26. Madrid, September 1927.

In experiments, sweetened arsenical bait-sprays have given excellent results against the olive fly [*Dacus oleae*] in Spain. The Berlese method of spraying the foliage is preferred because of its greater simplicity and cheapness, but the Lotrionte method of spraying bundles of twigs is to be further tried against *Ceratitis capitata*, Wied., on such delicate fruits as apricots, etc., where direct treatment may prove injurious.

Cabrera Díaz (A.). **Nuevas observaciones acerca de la *Icerya purchasi*, Mask., y de sus parásitos entomófagos en Tenerife.** [New Observations on *I. purchasi* and on its entomophagous Parasites in Teneriffe.]—*Bol. Pat. veg. Ent. agríc.*, ii, no. 5–7, pp. 31–35. Madrid, September 1927.

In 1926 *Icerya purchasi*, Mask., was found on an ornamental tree, *Jacaranda ovalifolia*, in Teneriffe, having probably been imported from California, and the infestation soon spread to many other plants. It is attacked by a Hymenopterous parasite, believed to be *Coccophagus lunulatus*, How., and the Coccinellid, *Scymnus canariensis*, Woll.

Gómez Clemente (F.). **La "caparreta blanca" en los naranjales de Castellón** (*Ceroplastes sinensis*, **Del Guercio).** [*C. sinensis* in the Orange Plantations in Castellón.]—*Bol. Pat. veg. Ent. agríc.*, ii, no. 5–7, pp. 14–23, 4 figs., 4 refs. Madrid, September 1927.

Ceroplastes sinensis, Del G., which was probably introduced on ornamental plants early in the present century, is now a pest of *Citrus* in the province of Castellón. Each female lays about 2,000 eggs. The larvae appear in July and August and attach themselves to the leaves, becoming adult in October and November. The injury done is increased by the sooty fungus, *Pleosphaeria citri*. In Spain the natural enemies of *C. sinensis* include a Chalcid, *Scutellista cyanea*, Motsh., and the Coccinellids, *Chilocorus bipustulatus*, L., and *Exochomus quadripustulatus*, L., but they are insufficient to control it. Sprays are therefore recommended, including lime-sulphur, various oil emulsions and a resin-alkali solution, known as the Serrano formula, containing pure resin 16 lb., sodium carbonate 8 lb., potassium chloride 11 oz., *Inula viscosa* 4 or 5 shoots of 20 inches, water 100 gals. In August and September fumigation with hydrocyanic acid gas may be employed.

del Cañizo (J.). **Las cochinillas del olivo y su tratamiento.** [Scales infesting Olives and Measures against them.]—*Bol. Pat. veg. Ent. agríc.*, ii, no. 5–7, pp. 43–47, 3 figs. Madrid, September 1927.

The Coccids infesting the olive in Spain are *Saissetia oleae*, Bern., and *Aspidiotus hederae*, Vall. *Lepidosaphes ulmi*, L., has also been recorded on olive, but is more frequently found on other plants. *S.*

oleae has two generations a year. Its natural enemies are *Scutellista cyanea*, Motsh., the Noctuid, *Eublemma* (*Coccidiphaga*) *scitula*, Rbr., and the Coccinellids, *Chilocorus bipustulatus*, L., and *Exochomus quadripustulatus*, L. An oil emulsion or the Serrano formula [see preceding paper] may be employed against *S. oleae*. Fumigation with hydrocyanic acid gas or spraying with 16 lb. pine resin and 8 lb. sodium carbonate in 100 gals. water are recommended against *A. hederae*.

El servicio de consultas sobre plagas y enfermedades de las plantas cultivadas en el año 1926. [The advisory Service on Pests and Diseases of cultivated Plants in 1926.]—*Bol. Pat. veg. Ent. agríc.*, ii, no. 5–7, pp. 48–60. Madrid, September 1927.

A list is given of the various pests and diseases regarding which advice was sought in 1926 from the various phytopathological stations in Spain. The food-plants and localities are mentioned in each case.

PATTERSON (W. H.). **Notes on Termites in the Gold Coast.**—*Bull. Dept. Agric. Gold Coast*, no. 7, (*Yearb. 1926*), pp. 35–39. Accra, 1927.

This paper is a reprint of the information on termites contained in one already noticed [*R.A.E.*, A, xv, 23], with the addition of a list of the 28 species concerned and details of the situations in which they were found and the nature of the injury caused by them.

D'EMMEREZ DE CHARMOY (D.). **[Report of] Entomological Division.**—*Rep. Dept. Agric. Mauritius 1926*, pp. 11–12. Mauritius, 1927.

The operations against *Lachnosterna* (*Phytalus*) *smithi*, Arrow, have already been noticed from another source [*R.A.E.*, A, xv, 550]. Outbreaks of *Rhizotrogus pallens*, Arrow, on sugar-cane were successfully controlled by collection of the beetles at night.

Other pests recorded during 1926 include *Spodoptera mauritia*, Boisd., *Heliothis* (*Chloridea*) *obsoleta*, F., and *Prodenia litura*, F., on tobacco; *Porpe bjerkandrella*, Thunb., on artichoke; and *Cirphis* (*Leucania*) *unipuncta*, Haw., on sugar-cane.

MUNRO (J. W.). **Beetles injurious to Timber.**—*Bull. Forestry Comm.*, no. 9, 29 pp., 6 pls., 20 figs. London, 1928.

Among the beetles attacking timber, pinhole borers (Scolytids and Platypodids) and Longicorns are forest insects and attack timber immediately after it is felled, leaving it when it has become dry or seasoned; powder-post beetles (Bostrychids and Lyctids) attack seasoned timber in timber yards; and furniture beetles (Anobiids) infest antique furniture and the roofs of old buildings.

A general description of Longicorns is given, with notes on their life-history as a whole. Occasionally the larval period may be abnormally extended, and may last as long as 40 years, apparently as a result of the larva being in dry timber. The entire injury caused to timber by Longicorns is effected during the larval stage, the majority being scavengers, hastening the decay of dead or dying trees. Only a few species attack timber when felled, and still fewer cause damage to healthy trees. Damage to imported timber caused by Longicorns, one or more species of which occur in nearly all kinds of trees, is confined to the sapwood, though in ring-porous woods, such as hickory and American ash, the larvae bore extensively and even reach the inner layers of the heartwood, the species chiefly concerned being *Neoclytus* and *Cyllene* spp. The sapwood of Polish oak is frequently extensively tunnelled by Longicorn larvae, chiefly *Phymatodes testaceus*, L. Other Longicorns found in hardwoods are *Plagionotus* (*Clytus*) *arcuatus*, L., and *Cerambyx cerdo*, L., from Poland and Austria. The following Longicorns, found chiefly in timber from Scandinavia and Russia, occur in imported softwoods: *Callidium violaceum*, L., in larch and pines; *Hylotrupes bajulus*, L., and *Tetropium luridum*, L., in spruce; *T. gabrieli*, Weise, in larch; and *Acanthocinus aedilis*, L., *Asemum striatum*, L., and *Monochamus* sp. in pine and spruce. American softwoods harbouring Longicorns include pines, and less commonly Douglas fir [*Pseudotsuga taxifolia*] and Sitka spruce [*Picea sitchensis*]. Imported Longicorns, with the possible exception of *Hylotrupes*, rarely increase in timber yards, as they prefer unseasoned to seasoned timber, nor does injury caused by them extend to adjacent timber, though they may spread to forest districts among which saw-mills are situated. Timber in the round is more likely to harbour larvae than sawn or converted timber.

Longicorns found in timber in Britain include *P. testaceus*, *Rhagium indagator*, F., *Strangalia armata*, Hbst., and *Liopus nebulosus*, L., in hardwoods, the last three living in partly decayed sapwood; and *A. aedilis*, *Criocephalus rusticus*, L., and *Asemum striatum*, L., in pine, and *T. gabrieli* in larch. The best method of preventing injury is the rapid conversion or early removal of timber from the forest, losses being reduced to a minimum by this means where fellings are undertaken before the beetles fly. Individual trees may be felled as traps before extensive fellings are made, and the barking of logs immediately after felling will prevent oviposition.

The pinhole borers, although they bore deeply into the wood, feed, not on it, but on the ambrosia fungus introduced by the female beetles that grows in the tunnels. The Scolytids are the more numerous in species, the chief of those injurious to timber belonging to the genus *Xyleborus*, while among the Platypodids the commonest species belong to the genera *Platypus*, *Crossotarsus*, and *Diapus*. The life-histories of all pinhole borers are somewhat similar, the females cutting tunnels into the sapwood in which eggs, larvae, pupae and adults may occur together.

Timber is attacked immediately after, or within a few weeks of, felling, the borers being unable to live in seasoned timber because the drying process prevents the growth of the ambrosia fungus. They occur more often in hardwoods than in softwoods. Though the value of the timber is reduced by pinholes that spoil its appearance, the actual mechanical injury done is slight except in heavily attacked logs. Secondary damage consisting of a longitudinal stain caused by fungus growth on each side of the pinhole is most apparent in white woods, but occurs in all cases and is often more important than the pinholes themselves. Timber felled in winter is rarely attacked. In the tropics, where the borers are active all the year round, they may be controlled by barking or removal of trees immediately after felling, or stripping of both bark and sapwood from the logs a week or two later.

Of the powder-post beetles, the Bostrychids cause injury in both the adult and larval stages, both of which are briefly described. The females enter the wood to oviposit, the males assisting them to cut the tunnel, which is Y-shaped and follows the direction of one of the annual rings. The tunnels cut by the larvae run parallel with the axis of the tree or branch. As most Bostrychids are tropical or sub-tropical insects, only attacking hardwoods, and infestation by them generally necessitates rejection of the wood before shipment, they are not common in timber imported into Britain.

The Lyctids lay their eggs in the pores instead of boring deeply into the wood. The life-cycle of *Lyctus*, the chief genus of economic importance, usually occupies a year. The beetles may appear in March indoors, but are normally active from May to August. Mating and oviposition follow immediately after emergence, the eggs hatching in 7–10 days. The larvae bore in the wood, feeding in the region of the spring zone and returning to the surface to pupate. The pupal chamber is covered only by a film of wood, which is broken by the emergence of the adult. *Lyctus* attacks only recently seasoned hardwoods, whether manufactured or not, old furniture or newly felled timber being immune, and considerable damage is caused to furniture, tennis racquets, tool handles, etc., in workshops and stores. Close-grained, narrow-pored woods, such as mahogany (*Swietenia*), birch, beech and maple, as well as all softwoods, are free from attack, while the most important woods damaged are oak, ash, hickory, sweet chestnut and walnut.

Species occurring in Britain are *L. linearis*, Goeze, found in oak palings, in hop poles and in ash used for tool-handles ; *L. brunneus*, Steph., imported from Austria in sweet chestnut and subsequently infesting ash and sweet chestnut used for making walking-sticks ; and *L. planicollis*, LeC., introduced into Britain within the past 7 years. Consignments of oak and ash from America, badly infested with the last two of these beetles, arrived in Britain during the War, and infested material, which is difficult to recognise from October to March when the larvae are inactive, is still imported from this source and distributed throughout the country, though *Lyctus* now occurs chiefly in English and Polish oak. Even when the injury is apparent, this timber commands a market, though at a reduced price, and the distribution of the pest is thus maintained.

Damage from *Lyctus* can be prevented or reduced by the removal of sapwood from oak and ash before it is made into furniture, though this is only economically possible in the case of high-grade goods.

Much of the information in regard to sterilisation and treatment with insecticides has already been noticed [*R.A.E.*, A, xiii, 45 ; xvi, 139]. Steam kiln sterilisation is considered the most promising method, and is particularly suitable for adoption by the furniture trade, which suffers most severely from injury by *Lyctus*. The possibility of using various insecticides is also discussed.

Anobiids, which occur in both coniferous and hardwood timbers, attack both heartwood and sapwood, showing a preference for thoroughly matured wood and breeding out of doors in the dead and decaying wood of dying trees. *Anobium punctatum*, DeG., is the species most commonly found in furniture and the woodwork of houses. Its life-cycle usually lasts about a year. The adults emerge in June or July and lay their eggs in cracks and crevices of the wood. The larvae tunnel in the wood, forming a granular dust, and eventually make their way to the surface to pupate. The pupal beds may sometimes be located by means of a minute hole gnawed by the larva in the cell wall. *Xestobium rufovillosum*, DeG. (death-watch beetle), which causes damage to the roof and timber structure of ancient buildings, pupates in spring, the adults emerging the following autumn, or even in the spring of the following year. The life-cycle may apparently be prolonged up to 3 years. *Ernobius mollis*, L., which is less common in furniture and buildings, prefers coniferous softwoods, and generally confines its attacks to unbarked timber. The life-cycle occupies about a year, the beetles appearing in April and May. The life-cycle and habits of *Ptilinus pectinicornis*, L., resemble those of *A. punctatum*; it is chiefly found in beech and maple furniture.

Seasoned, manufactured timbers, chiefly oak, beech, birch and walnut, are most frequently attacked in Britain, generally after considerable use. Where surfaces of infested woodwork are easily accessible and discolouration of the wood is not a drawback, turpentine and heavy paraffin oils and creosotes applied in late spring or early summer are the best insecticides for the treatment of timber infested by Anobiids, four applications being necessary in the case of *Xestobium* to ensure the destruction of all larvae. A mixture devised by H. M. Lefroy, for use in cases where it is necessary to retain the colour of the wood, consists of 91 parts orthodichlorobenzene, 7 parts castile soap and 2 parts cedar wood oil.

Thorough cleaning of woodwork before treatment and careful application of the insecticide are essential. Spray should be applied with a high-pressure sprayer having a fine nozzle and a container lined with acid-proof metal. If the insecticide is applied with a brush no crevices or joints should be overlooked. Successful control of *A. punctatum* and *X. rufovillosum* can only be secured by thorough periodic application of an insecticide extending over several years. Mercury bichloride is too dangerous a poison for use in buildings, and zinc chloride cannot be applied to roofs as it is only effective when wood is soaked in it.

Le Souné ou Sen (*Eurygaster integriceps*) **et ses dégâts en Syrie et en Perse.**—*Conf. internat. Blé, 1927*, 46 pp., 2 maps. Rome, Institut International d'Agriculture, 1927. Price *Lire* 10.

This paper is divided into three parts, two of which have already been noticed [*R.A.E.*, A, xv, 14]. The third, by A. H. Adle, deals with the characteristics and history of *Eurygaster integriceps*, Puton, in Persia. Contrary to observations made in Syria, where the development of the insect is otherwise very similar, cold is sometimes fatal to it, and hibernation takes place in mountainous districts from which the first spring invasion originates. These regions are so inaccessible as to render the campaign against the insect extremely difficult. *E. integriceps* enters the soil beneath wild plants, the depths to which it descends varying with the intensity of the cold. In February, when the snows begin to disappear, it leaves the ground, and early in March flies in swarms to attack the wheat growing in the plains. Particularly serious damage is caused in Veramine, the most important grain producing district for Teheran, where barley is sometimes attacked as well as wheat, the insect having also been found on clover and wild plants. The source of nourishment during the period from emergence from the soil until the flight to the plain is unknown, as there is little vegetation in the mountains and the insect is believed to feed almost exclusively on wheat. Details of the life-history and injury caused are in the main similar to those already noticed from Russia [*R.A.E.*, A, i, 446]. The extent of the damage varies from year to year, the entire crop being sometimes destroyed and the inhabitants being forced by famine to move to another part of the country. The wheat harvest takes place early in July, and as the grain hardens, the insects, which have now reached the adult stage, are forced to leave it. Observations show that *E. integriceps* in Persia migrates a second time after mating and oviposition, when it flies southwards. Nothing is known of what occurs between migration and the return of the insect in mid-July to the mountains.

Control measures consist of hand collection, first in the hibernation quarters, beginning as soon as the snows melt, and later, after the first migration, in the plains. In 1925 nearly 3½ tons were collected in the mountains and nearly 22 tons in the plains. Infested leaves, containing on an average 14 insects each, are also collected. *E. integriceps* has not yet been seen in Persia to move as it does in Syria to the wheat ears in the cool morning and evening, descending during the hottest part of the day to shelter beneath the plant and under the leaves, thus greatly facilitating the work of collection. A number of insects may be destroyed by burning the wild food-plants after spraying them with kerosene in February or March, this method being more rapid than collection. However, this involves burning all the plants present, many of which do not harbour the insects, and there is great difficulty in making the workers carry out their task satisfactorily. One of the best preventive measures is to sow in October and to grow early varieties of wheat only, as these are sufficiently mature by the time the insect appears to be resistant to it. If the wheat is not too far advanced when an infestation occurs, the insects can be destroyed by allowing sheep to graze over the crop, which will then grow again after irrigation. The possibility of using various insecticides is briefly discussed.

BALLARD (E.). **Some new Indian Miridae (Capsidae).**—*Mem. Dept. Agric. Ind. Ent.*, x, no. 4, pp. 61–68, 7 pls. Calcutta, July 1927.

The Capsids described include: *Deraecoris maculatus*, sp. n., on mango leaves; *D. indicus*, sp. n., on cotton infested with *Aphis gossypii*, Glov., and on *Crotalaria juncea*; *D. aphidicidus*, sp. n., which was bred from eggs in cotton stems and is predacious, especially on *A. gossypii*; *Megacoelum esmedorae*, sp. n., on *Melia azadirachta* (*Azadirachta indica*); and *Cyrtopeltis caesar*, sp. n., on tobacco.

FELT (E. P.). **Four new Indian Gall Midges.**—*Mem. Dept. Agric. Ind. Ent.*, x, no. 1, pp. 1–4. Calcutta, July 1927.

Among the species described is *Schizobremia malabarensis*, sp. n., reared from *Ferrisia* (*Pseudococcus*) *virgata*, Ckll.

HUSAIN (M. A.) & NATH (D.). **The Citrus Psylla** (*Diaphorina citri*, **Kuw.) Psyllidae: Homoptera.**—*Mem. Dept. Agric. Ind. Ent.*, x, no. 2, pp. 5–27, 4 pls., 3 figs., numerous refs. Calcutta, July 1927.

Diaphorina (*Euphalerus*) *citri*, Kuw. (citrus psylla), all stages of which are described, is widely distributed throughout the Orient and has already been noticed as a severe pest in India [*R.A.E.*, A, xiii, 222, etc.]; it attacks Rutaceae, records on *Cordia* [*cf. R.A.E.*, A, vi, 15] being due to misidentification, and its food-plants include all cultivated varieties of *Citrus*. The young shoots are attacked and killed, and in the course of two or three seasons, if infestation is heavy and no means of control are adopted, the trees are completely defoliated and begin to dry up, the fruit either dropping off, not setting or becoming dry and insipid. The greatest activity of the Psyllid corresponds with the period when fresh shoots appear and leaves are produced in great abundance; a large amount of damage is, therefore, done at these periods. The pest becomes active about the end of February, and its numbers rapidly increase during March and April, adults predominating from May to June and fresh colonies developing in July. About the middle of October it begins to disappear and occurs only in small numbers during December and January; hibernation has not, however, been noticed in any particular stage.

Mating takes place shortly after emergence, but oviposition may be deferred. Adults that emerged at the end of August laid no eggs until a month later, and those emerging at the end of October until three months later, this being in all probability due to the absence of young shoots at these periods, neither eggs nor nymphs ever being found on the tougher, older growth. In captivity, one female was found capable of laying over 800 eggs and continued to oviposit for about 2 months. There are 9 generations a year. The egg stage occupies about 4–6 days in summer and up to 22 days in winter, and the total duration of the nymphal instars varies from 11 to 25 days; adults have been known to live for 189 days. The nymphs congregate on the young shoots and feed inside the unopened leaves, between the axillary bud and the stem, or in the tender portion of the stem itself, and do not as a rule move much, although when overcrowded, they crawl down the stem and feed on the larger leaves and thicker parts of the tender stem. They suck the cell sap, exuding honeydew, which encourages the growth of fungi on the leaves.

The egg and adult stages of *D. citri* appear to be comparatively free from natural enemies, but the nymphs are attacked by the Coccinellids, *Coccinella septempunctata*, L., *C. repanda*, Thunb., *Chilomenes sexmaculata*, F., *Chilocorus nigrita*, F., and *Brumus suturalis*, F. Nine different species of Chalcid parasites, the most important of which is *Tetrastichus radiatus*, Wtrst., have been reared from the nymphs, the rate of parasitism being sometimes as high as 95 per cent. When this is the case, *D. citri* seldom increases sufficiently to cause serious damage.

Spraying with contact insecticides has proved effective. For spring spraying against the nymphs 2 parts tobacco refuse, by weight is soaked in 10 parts water for 24 hours; ½ part soap is then added, the whole being diluted with 8 parts water. For a winter spray against the adults 4 lb. resin and 2 lb. soda are placed in a vessel with sufficient water to cover, and then heated slowly until they are dissolved, 4 gallons water being added slowly during the process, which is continued until the solution mixes readily with the water without producing a milky emulsion. The whole solution is then diluted with 6 parts water and 2 lb. solignum is added. Trees carefully sprayed with this mixture should not need a spring spray, but if this is necessary, it should be applied in March, when most of the nymphs have hatched and the new brood of adults has not yet emerged; the eggs are difficult to kill and a third spraying may be needed after about a week.

Harukawa (C.). **Studies on the Toxicity of Lime-sulphur Mixture.**—*Ber. Ōhara Inst. landw. Forschungen*, iii, no. 4, pp. 379–396, 4 refs. Kuraschiki, 1927. Also in Japanese with a Summary in English in *J. Agric. Soc. Japan*, no. 293, pp. 129–147. Tokyo, 1927.

In a previous paper the effects on Coccids of two kinds of lime-sulphur as sprays were discussed [*R.A.E.*, A, x, 289]. Here the results are given of experiments in which goldfish and nymphs of the dragonfly, *Anax parthenope*, were immersed in lime-sulphur solutions at various concentrations. A mixture in which equal parts of lime and sulphur are used was found to be considerably more toxic than one in which the amount of sulphur is double that of the lime. The amount of oxygen in a lime-sulphur solution must be very small owing to the reducing action of the lime-sulphur, and the experiments indicate that suffocation by reduction and corrosive action are two of the important causes of the toxicity of this material. The effects on scale insects are probably the same, differing merely in intensity.

Steinmann (A.). **Over het optreden van een nieuwe luizenschimmel bij de thee** (*Nectria coccidophthora* **Zimmermann).** [On the Occurrence on Tea of a new Scale Fungus, *N. coccidophthora*.]—*De Thee*, vii, no. 2, pp. 49–52, 4 pls., 6 refs. Batavia, June 1926. [Recd. 1928.]

The fungus, *Nectria coccidophthora*, is recorded as infesting the Coccids, *Diaspis* sp. and *Aspidiotus* sp., on tea in Java.

Keuchenius (A.). **Een rupsenplaag in** *Indigofera*. [A Caterpillar Pest on *Indigofera*.]—*De Thee*, vii, no. 3, pp. 95–96, 1 ref. Batavia, September 1926. [Recd. 1928.]

In Java the green manure plant, *Indigofera endecaphylla*, has been attacked by the larvae of the Tineid, *Dichomeris ianthes*, Meyr. At the tea experiment station at Buitenzorg all the plants were defoliated in 1925. Various sprays were used with success, but in 1926 spraying was not practised and a Hymenopterous parasite that had been noticed in 1925 brought the moth under control.

Gandrup (J.). **Verslag over het jaar 1926.** [Report of the Besoeki Experiment Station for 1926.]—*Meded. Besoekisch Proefst.*, no. 43, 42 pp. Djember, 1927.

Pests of green manure plants observed during the year included *Ragmus importunitas*, Dist., on *Crotalaria anagyroides*, and *Dichomeris ianthes*, Meyr., on *Indigofera endecaphylla*. Coffee pests included *Coccus* (*Lecanium*) *viridis*, Green, of which heavy infestations occurred in dry areas, *Epicauta ruficeps*, Ill., a Limacodid, *Nagoda* sp., *Xyleborus coffeae*, Wurth, and *Stephanoderes hampei*, Ferr. The last two were of little importance. About 70,000 individuals of the parasite of *S. hampei* [*Prorops nasuta*, Wtrst.] were bred.

Leefmans (S.). **Ziekten en plagen der cultuurgewassen in Nederlandsch-Indië in 1926.** [Diseases and Pests of Cultivated Plants in the Dutch East Indies in 1926.]—*Meded. Inst. PlZiek.*, no. 73, 60 pp. Buitenzorg, 1927.

Many of the pests recorded here were noticed in the previous report [*R.A.E.*, A, xiv, 520]. Others include *Platypus cupulatus* and *P. lepidus* boring in *Agave*; *Aproaerema nerteria* and *Empoasca flavescens* on ground-nuts (*Arachis*); *Lawana candida* on *Crotalaria anagyroides*; *Melanagromyza dolichostigma* on *Calopogonium*; *Dichomeris ianthes* on *Indigofera*; *Hyposidra talaca* on *Mimosa*; *Epicauta ruficeps* on *Centrosema pubescens*; *Mudaria variabilis, Zeuzera coffeae, Arbela* sp., and *Dysdercus cingulatus* on kapok; *Pyroderces coriacella* and *Platyedra gossypiella* on cotton; *Plagiodera inclusa* on soy-bean [*Glycine hispida*]; *Glyphodes psittacalis, Odonestis plagifera, Cricula trifenestrata, Apoderus cinchonae* and *Pachypeltis vittiscutis* on cinchona; *Aspidiotus destructor* and *Brontispa selebensis* on coconut; *Acara morosella* and *Agestrata orichalcea* on *Pandanus*; *Xyleborus morigerus* and *Valanga nigricornis* on coffee; *Dacus ferrugineus* on *Capsicum*; the larvae of *Cirphis* (*Leucania*) *? unipuncta* and *Holotrichia helleri* on maize; *H. helleri* and *Hesperia philino* on rice; *Dicranotropis vastatrix* and *Aleurodes longicornis* on sugar-cane; *Phthorimaea* (*Gnorimoschema*) *heliopa, Heliothis assulta, Prodenia litura* and *Myzus persicae* on tobacco; and *Xyleborus morigerus* on tea.

Schwarz (M. B.). **Eenige ziekten van onbekenden aard bij groenbemesters.** [Some Diseases of unknown Nature in Green Manure Plants.]—*Korte Meded. Inst. PlZiek*, no. 5, 19 pp., 11 figs. Buitenzorg, 1927.

It is not known whether the witches' broom or curly disease of *Crotalaria anagyroides* and *C. juncea* in Java are virus diseases. If they are, the Capsid, *Ragmus importunitas*, Dist., the Jassid, *Empoasca flavescens*, F., and perhaps a black Aphid, *Aphis medicaginis*, Koch, may be vectors. In order to ascertain if a peculiar bending of the stalks at the top of plants of *C. anagyroides* was due to a virus disease, attempts were made to transmit it by means of *R. importunitas*, but without success. There is a possibility that the curly disease of *Calopogonium mucunoides*, which does not give rise to witches' broom, is due to a virus, in which case the Lygaeid, *Chauliops bisontula*, Banks, or the Capsid, *Halticus tibialis*, Reut., may be involved.

Leefmans (S.). **Proeven in zake de mogelijkheid van bespuiting van hooge klapperboomen bij rupsenplagen.** [Experiments in spraying tall Coconut Palms against Caterpillars.]—*Landbouw*, iii, no. 5, pp. 260–270, 3 figs. Buitenzorg, 1927. (With a Summary in English.)

An apparatus for applying a lead arsenate spray against Lepidopterous larvae, such as *Artona* (*Brachartona*) [*catoxantha*] and *Hidari* [*irava*], and Hispid beetles on coconuts is described. It is a portable sprayer that can be hoisted up palms 15–40 ft. in height, the operator moving freely in the crown. Three men can spray a tree in 15 minutes, using about 3 gals. of 1½ per cent. lead arsenate.

LEEFMANS (S.). **Voorloopige aanteekeningen in zake het javaansche manggakevertje** (*Cryptorrhynchus gravis* **F.**). [Provisional Notes on the Javanese Mango Weevil, *C. gravis*.]—*Landbouw*, iii, no. 5, pp. 306–309. Buitenzorg, 1927. (With a Summary in English.)

The collections of the " Instituut voor Plantenziekten," Buitenzorg, contain weevils supposed to be *Cryptorrhynchus mangiferae*, F., a species found in Madras [*R.A.E.*, A, xv, 357], but some weevils taken on mango at Buitenzorg have proved to be *C. gravis*, F. Both species occur in the Federated Malay States ; in the Philippines and Ceylon only *C. mangiferae* is found. *C. gravis* has been recorded from Bengal. The species taken at Buitenzorg is at least biologically different from that in Madras, the latter almost always boring in the stone, whereas the former develops in the flesh of the fruit and eats only the fibrous layer of the stone.

Entomological Branch.—*Rep. Minist. Agric. Canada 1925–26*, pp. 95-111. Ottawa, 1926.

Among the important pests of cereals, *Pyrausta nubilalis*, Hb., extended its range in Ontario and caused increased loss to the maize crop. The problem presented by this insect, which is alarming, is discussed. Important saving of crops was secured by the observance of precautionary measures against grasshoppers in British Columbia, where the attack was confined largely to the dry interior and involved approximately the same area as in 1924. The red-backed cutworm [*Euxoa ochrogaster*, Gr.] was widespread and destructive in Saskatchewan, where the losses caused were estimated at £800,000. A severe outbreak of the pale western cutworm [*Porosagrotis orthogonia*, Morr.] caused extensive losses to cereals in Alberta, where, however, the situation is well in hand. The rapid increase of this cutworm in Saskatchewan, on the other hand, is more serious in view of the possibility that the measures carried out in Alberta may not be applicable there. The variegated cutworm [*Lycophotia margaritosa*, Haw.] caused injury to field and garden crops in New Brunswick.

Among forest pests, the spruce budworm [*Tortrix fumiferana*, Clem.] is still present in eastern forests, though the injury caused was reported to be decreasing in severity in 1925. An extensive attack also occurred in central Ontario. Outbreaks of the forest tent caterpillar [*Malacosoma disstria*, Hb.] are decreasing in the south and increasing in the north of Saskatchewan. The European elm leaf-miner [*Kaliofenusa ulmi*, Sund.] has become established in southern Quebec and southern Ontario. The European pine shoot moth [*Rhyacionia buoliana*, Schiff.] has been introduced into Canada on imported pines and has become established in Toronto and probably elsewhere. The beech bark louse of Europe [*Cryptococcus fagi*, Bär.] has become established in the Maritime Provinces, killing numbers of beeches throughout the infested area. Other forest insects include the maple leaf-cutter [*Paraclemensia acerifoliella*, Fitch], the lilac leaf-miner [*Gracilaria syringella*, F.] and the larch sawfly [*Lygaeonematus erichsoni*, Htg.].

Fruit insect investigations resulted in the discovery of new infestations of the codling moth [*Cydia pomonella*, L.] in British Columbia in 1925, while the oriental peach moth [*Cydia molesta*, Busck] was found, late in the season, in several widely scattered peach orchards in the Niagara district, where also the grape-berry moth [*Polychrosis viteana*, Clem.] has recently come into prominence as a serious pest. A 3 per cent. oil emulsion has proved successful against the pear psylla [*Psylla pyricola*, Först.].

Apple case-bearers [*Coleophora* spp.] caused serious injury to foliage in Quebec in 1925. The oblique-banded leaf-roller [*Tortrix rosaceana*, Harr.] and the eye-spotted bud moth [*Eucosma ocellana*, Schiff.] were probably the most injurious fruit-tree insects of the year in Nova Scotia, where the rosy aphis [*Anuraphis roseus*, Baker] and the green apple aphis [*Aphis pomi*, DeG.] also caused considerable damage. Proprietary oils and cold mixed oil emulsions, which admitted of the addition of lime-sulphur against blister mites [*Eriophyes pyri*, Nal.], were successfully used against the fruit-tree leaf-roller [*Tortrix argyrospila*, Walk.] in British Columbia.

A total of 951,000 individuals of *Microbracon* (*Habrobracon*) *brevicornis*, Wesm., and 36,700 of *Pimpla* (*Exeristes*) *roborator*, F., parasites of *Pyrausta nubilalis*, were liberated during the year in Ontario. The apple-sucker [*Psylla mali*, Schmidb.] has been greatly reduced in Nova Scotia by the distribution in infested areas of the fungus, *Entomophthora sphaerosperma*, and similarly successful results have been obtained there with *Empusa erupta* against *Lygus communis* var. *novascotiensis*, Knight (green apple bug).

BROMLEY (S. W.). **Cyanogas Calcium Cyanide for the Fumigation of Flour Mills.**—*Res. Devmpt. Cyanogas Calcium Cyanide*, Sect. 3, pp. 89–110, 5 figs. New York, N.Y., Amer. Cyanamid Co., 15th February 1928.

Tests in the fumigation of flour mills with four types of cyanogas calcium cyanide, "A" dust [*R.A.E.*, A, xiv, 74], "G" fumigant [xiv, 444], granular and flakes [all of which contain not less than 40 and not more than 50 per cent. calcium cyanide], showed that where properly applied this fumigant is effective for the control of insect pests.

Insects encountered in the tests included *Ephestia kühniella*, Zell. (Mediterranean flour moth), *Tribolium confusum*, Duv. (confused flour beetle), *T. ferrugineum*, F. (rust-red flour beetle), *Tenebroides mauritanicus*, L. (cadelle), *Tenebrio molitor*, L., *T. obscurus*, F., *Silvanus* (*Oryzaephilus*) *surinamensis*, L. (saw-toothed grain beetle), *S. gemellatus*, Duv. (square-necked grain beetle) *Crypturgus pusillus*, Gyll. (flat grain beetle), *Alphitobius piceus*, Ol. (black fungus beetle) *A. bifasciatus*, Say (two-banded fungus beetle), *Sitodrepa panicea*, L. (drug-store beetle), *Attagenus piceus*, Ol. (black carpet beetle), *Dermestes lardarius*, L. (larder beetle), *Anthrenus* sp., *Calandra* (*Sitophilus*) *granaria*, L. (granary weevil), *C.* (*S.*) *oryzae*, L. (rice weevil) and *Sitotroga cerealella*, Ol. (Angoumois grain moth).

Adults of *S. cerealella* are killed and the majority of adult weevils stupefied by a general fumigation. The weevils, if not swept up with the residue and disposed of, are greatly weakened and die soon after revival, while *Tribolium* and *Tenebroides mauritanicus* live as long as the controls if not killed outright. *T. mauritanicus* often tunnels into the woodwork in wooden mills, where the pupae survive. Practically 100 per cent. control of the remaining insects was secured in the tests, though the susceptibility of the individual species varies considerably and the adults are more easily killed than the larvae or pupae. *E. kühniella* is the most readily killed, all stages, including the eggs, succumbing if not covered with more than 1 in. of flour, while the beetles, particularly *T. mauritanicus* and *C. pusillus*, are more resistant.

A dosage of 2 lb. to 1,000 cu. ft., with an exposure of 36 hours, is considered advisable for general use, though 1½ lb. gave satisfactory results in air-tight mills. The cyanide is broadcast over the floors with a shovel. The temperature should be 65° F. or over, and the relative humidity over 40 per cent. As hydrocyanic acid gas is lighter than air and tends to rise, a lighter dosage may be applied on upper floors and a correspondingly heavier one on the lowest floor. As the gas will not penetrate flour and mill products beyond 1 in., adequate cleaning of the mill previous to fumigation is essential. Loosely constructed wooden buildings must be rendered air-tight, windows or cracks being sealed with paper and spaces beneath doors blocked with earth.

Fumigation should be carried out in warm, windless weather, though if it should be necessary to fumigate under a steady breeze, the cyanogas should be spread more heavily on the windward side of the building.

A comparative test with "G" fumigant at the rate of 2 lb. and sodium cyanide at the rate of 1 lb. to 1,000 cu. ft. showed the two materials to be about equally effective. Counts of *C. oryzae* after fumigation, however, showed the calcium cyanide to be more successful in the control of this weevil, probably owing to the fact that it crawled through the fumigant scattered on the floors.

JACOBSEN (W. C.). [**Report for 1926 of the**] **Bureau of Plant Quarantine and Pest Control.**—*Mon. Bull. Calif. Dept. Agric.*, xv, no. 7–12, pp. 113–142. Sacramento, Cal., 1927.

The citrus whitefly [*Dialeurodes citri*, R. & H.] has been known to exist in California since 1907, though its spread has been limited owing to unfavourable climatic conditions ; it has, however, maintained itself in sheltered spots in certain towns. In an organised campaign oil sprays were found to be effective in killing the larvae during the winter.

Pests intercepted at sea-ports recorded in the report on plant quarantine by A. C. Fleury include : *Platyedra* (*Pectinophora*) *gossypiella*, Saund. (pink bollworm), *Cydia* (*Carpocapsa*) *splendana*, Hb. (nut codling moth) and *Cylas formicarius*, L. (sweet potato weevil). A limited spread of the alfalfa weevil [*Hypera variabilis*, Hbst.] in western Nevada and eastern California in the spring and summer of 1926 necessitated an extension of the quarantine regulations to these areas. Though the new infestations were mainly due to natural flight, the insect had in one instance been carried by Indians in hay or bedding.

Tests carried out in Texas against *P. gossypiella* in railway wagons showed that fumigation for 4 hours with 20 oz. commercially pure calcium cyanide to 1,000 cu. ft. is effective. Other recent inter-state quarantine regulations, including those against *Rhagoletis cingulata*, Lw. (cherry fruit-fly) in Washington, are reviewed.

Special regulatory pest control is reported on by D. B. Mackie. Experiments with liquid hydrocyanic acid gas and calcium cyanide dust against *Dialeurodes citri* on *Citrus*, privet and other ornamental plants, a large number of which have been found to be infested by it, showed that a very heavy dosage was necessary to secure a kill of over 99 per cent., and this result could only be obtained under optimum conditions, even a wind velocity of only 4 miles an hour lowering the mortality ratio to 20 per cent. In view of the difficulties presented by climatic factors, fumigation is considered impracticable for the control of *D. citri*.

The 7 in. mercurial vacuum permitted in 1924 for the fumigation of citrus stock with hydrocyanic acid gas has proved insufficient, and certain trees treated by the new schedules showed signs of infestation in 1926. Fumigation with a 27 in. vacuum and a heavy dosage can be effected with many species of ornamental plants, 50 species infested with citrophilus mealybug [*Pseudococcus gahani*, Green] being successfully treated without injury.

In consequence of the discovery of the fact that the larva of the potato tuber moth [*Phthorimaea operculella*, Zell.] invariably leaves the tubers to pupate in the ground, potatoes can now be fumigated with a dosage of carbon bisulphide and carbon dioxide in combination low enough to be innocuous to them, which, while effective in killing the larvae present, would be insufficient to destroy the more resistant pupae.

As vacuum fumigation of narcissus bulbs for infestation by narcissus flies [*Eumerus strigatus*, Fall., and *Merodon equestris*, F.] according to the recommended schedules caused injury to the bulbs, general fumigation has been temporarily discontinued until a dosage that is both fatal to the fly and innocuous to the bulbs has been arrived at.

Dipterous larvae found in walnut husks in one locality proved to be those of the Ortalid, *Euxesta notata*, Wied., a scavenger of no economic importance.

T. D. Urbahns and H. C. Lewis, in their report on general entomology, record an attack on grape by *Drepanothrips reuteri*, Uzel, previously only recorded from Europe. Early infestations resulted in the destruction of terminal buds and young shoots, while scarring of berries and stem injury was caused by later attacks in June and July. Preliminary field tests with nicotine sulphate and refined oil emulsions gave very satisfactory control. *Listroderes obliquus*, Gyll. (tomato weevil), first reported in the spring of 1926, has already caused damage to carrots, turnips, spinach, potato and young tomato. Though spraying of infested areas with arsenical solutions gave temporary relief, eradication was found to be impossible. *Phthorimaea glochinella*, Zell. (egg-plant leaf-miner) attacked tomato in fields previously planted with egg-plant, burrowing into the stem and entering the heart of the fruit, and in some cases late in the season causing infestation amounting to 60–70 per cent. Good control of *Tetranychus telarius*, L. (red spider) was secured with highly refined white oil emulsions, when applied before webbing and defoliation had become severe, no damage being caused to prunes, plums, peaches or figs, provided that the vitality of the trees had not been impaired by infestation, heat, or lack of moisture. Temporary discoloration and loss of bloom on the fruit was caused by the oil emulsions on prunes and plums. *Glyptoscelis squamulata*, Crotch, attacked grapes and the terminal buds of peaches.

Brief notes are given on the problems presented by *Anarsia lineatella*, Zell. (peach twig borer) on peach and *Cydia* (*Carpocapsa*) *pomonella*, L., on apples and pears. The question of spray residues will necessitate a change in the established spray schedules, more attention being directed in future to delayed dormant spraying. *Eriosoma pyricola*, Bak. & Dav. (woolly pear aphis), which caused considerable injury to the roots of pear trees in young orchards in some districts, particularly in heavy soils, has been satisfactorily kept in check by autumn treatment with paradichlorobenzene. Losses varying from 500 to 2,000 boxes of pears rendered unmarketable were caused to many growers by *Eriophyes pyri*, Nal. (pear-leaf blister-mite). *Lecanium cerasorum*, Ckll. (calico scale) was unusually abundant in pear orchards. *Pyrameis* (*Vanessa*) *cardui*, L., was unusually abundant, attacking lettuce, prune, nursery stock and garden flowers. *Galerucella xanthomelaena*, Schr. (elm leaf beetle) increased and spread south and east, apparently with the prevailing winds.

In his paper on nursery pests, E. L. Smith records the occurrence of *Chrysomphalus dictyospermi*, Morg., as a pest of some importance on avocados.

McColloch (J. W.), Hayes (W. P.) & Bryson (H. R.). **Hibernation of certain Scarabaeids and their *Tiphia* Parasites.**—*Ecology*, ix, no. 1, pp. 34–42, 2 figs., 3 refs. Brooklyn, N.Y., January 1928.

This paper gives the results of observations to ascertain the depths to which Lamellicorn larvae and adults penetrate the soil to hibernate. In Kansas, 89 per cent. of all larvae found were below the plough line of 6 inches. No larva was found below 40 inches, and the majority were at 6–20 inches. None of the adults was found as deep as the larvae, except *Pinotus carolinus*, L., at 40 inches. Otherwise the greatest depth observed was 20 inches for *Lachnosterna* (*Phyllophaga*) *rugosa*, Melsh., with an average depth of 12–16 inches [*cf.* *R.A.E.*, A, vi, 364]. In other genera all adults were found below the plough line.

The cocoons of *Tiphia* spp. were found normally at an average depth of 11 inches, with extremes of 2 and 23 inches.

A study of soil temperature showed that most of the larvae and beetles burrow deeply enough to avoid freezing conditions.

Cole (F. R.). U.S. Bur. Ent. **New Facts about the Citrus Aphid and its Natural Enemies.**—*Proc. Florida Hort. Soc. 1926*, xxxix, pp. 156–158. DeLand, Fla., 1926.

During 1926 there was a marked decrease in infestation by *Aphis pomi*, DeG. (*spiraecola*, Patch) on *Citrus* in Florida, the outbreak, which reached its height in 1925, having steadily declined. There are about 20 species of insects attacking this Aphid. In addition to those previously dealt with [*R.A.E.*, A, xiii, 256] *Cycloneda munda*, Say, is recorded as the most efficient of the Coccinellid enemies. The adult lives from 45 to 80 days and destroys about 30 Aphids a day. It will also eat Coccids or Aleurodids and can live without food for about 10 days. Another important enemy is *Exochomus marginipennis childreni*, Muls., but this and similar Coccinellids appear too late to be of much value. A small Hymenopterous parasite has apparently been gradually adapting itself to *A. pomi*. In 1924, it was in many instances unable to complete development in this Aphid, but in some localities parasitism had reached as high a degree as 10 per cent. in 1926. It also attacks other species of Aphids. As the Aphids are dependent on new flush growth for their food, early flushing varieties of *Citrus*, such as grapefruit, encourage attack, and the loquat [*Eriobotrya japonica*] and celery may be sources of infestation to *Citrus*. Since climatic conditions are known to have great influence on the numbers of Aphids, studies are now being made of daily and monthly temperatures, humidity and rainfall, which may elucidate the problem of Aphid abundance in Florida.

WATSON (J. R.). **Another Year's Experience with the Citrus Aphis.**—*Proc. Florida Hort. Soc. 1926*, xxxix, pp. 159–164. DeLand, Fla., 1926.

The damage to *Citrus* in Florida by the citrus aphis [*Aphis pomi*, DeG.] was comparatively slight in 1926 owing to the consistently cold winter, which prevented the appearance of new growth on which the Aphids could pass the winter. Winter is obviously the time to combat the Aphids, the large majority of which are then found on *Citrus*, *Spiraea* and other food-plants being of minor importance, though a rather serious new food-plant in the past year was the laurel cherry [*Prunus caroliniana*]. The Aphids pass the winter as adults ; neither eggs nor egg-laying females have been found on *Citrus*. It is therefore essential to produce dormancy of the trees as early as possible. Cultivation should be discontinued by November at the latest, and heavy applications of nitrogen in autumn should be avoided. Persistently unhealthy trees, which are constantly attempting to put out new growth, should be destroyed. Any isolated colonies of Aphids appearing during winter should be dealt with by dipping in a bucket containing an insecticide such as 40 per cent. nicotine sulphate, using a tablespoonful and 1 or 2 oz. soap to 1 U.S. gal. water, or if they are on larger limbs that cannot be dipped, spot dusting should be practised ; this must be done when there is no wind. For heavy infestations, dusting under tents has resulted in an average mortality of 99·5 per cent. In the spring new growth should be stimulated as much as possible by the use of fertilisers and cultivation, in order to get as much growth as possible on the trees before the Aphids appear in injurious numbers. Tangerines are particularly liable to heavy infestation as they put out new growth while the foliage of oranges is hardening. Dusting with nicotine sulphate and lime on a still day has proved the best treatment for bearing groves, and as still days are rare during the time of Aphid activity a kind of hood has recently been used which makes dusting possible even in a stiff breeze. The influence of predacious insect enemies is discussed [see preceding paper]. They are only considered efficient in clearing up the remnants of a colony that has been checked by some other factor. The rate of breeding is also an important, factor ; the convergent ladybeetle [*Hippodamia convergens*, Guér.], for example, lays about 117 eggs in 31 days, during which time an Aphid will produce six generations. A few Coccinellids of the genus *Leis*, originally introduced from China, were obtained from California; these are about four times as large as the native species, and one individual destroys about 187 young Aphids in a day. About 2,000 have now been bred, and it is hoped to send out colonies before long. During the cold weather, when Aphids are scarce, these beetles are in hibernation. The Hymenopterous parasite that keeps in check the melon aphis [*Aphis gossypii*, Glov.] on *Citrus* and has recently been attacking *A. pomi* [see preceding paper] has in some cases produced 10 per cent. mortality of the latter ; in this new host the larva usually dies within the Aphid, being unable to complete development. In 1926, however, a larger proportion developed successfully than in the preceding year.

MILLER (R. L.). **Snuff as an Insecticide.**—*Proc. Florida Hort. Soc. 1926*, xxxix, pp. 165–168. DeLand, Fla., 1926.

Experiments are described proving that snuff is one of the most promising materials for combating the citrus aphis [*Aphis pomi*, DeG.]. The grade tested, which is sold as a fertiliser and only costs about 2*d*. a pound, contained 2½ per cent. ammonia, 1½ potash (not less than 4 per cent. total plant food), 1½ chlorine and 2·05 nicotine, and this was used in various combinations with 3 per cent. nicotine sulphate and lime dust. The dust was applied to heavily infested tangerine trees 7 ft. high, at the rate of ½-lb. to each tree, during calm weather at a temperature of 90° F., and observations were made at 24-hour intervals for a week after the applications. The mortality was 99 per cent. with nicotine sulphate and lime dust alone, and was equally high when this dust was combined with 25 or 50 per cent. snuff. Details are given of the number of Aphids found on the treated trees after one week. A second set of experiments was carried out with the same mixtures, and with snuff alone, when the foliage was covered with a thin film of water from a heavy dew, with 65° F. temperature and 70 per cent. humidity. In each case there was 99 per cent. mortality within 24 hours, the cost of the snuff alone being one-half that of the nicotine sulphate and lime. The snuff alone left a strong odour on the trees for a month. Snuff dusted on dry trees gave very poor results, but it was found that during the Aphid season about half the mornings were favourable for dusting. As snuff used dry was not effective, 2 parts of it were mixed with 1 part of finely ground anhydrous calcium chloride, which causes the snuff to become moist on the leaf ; this gave 96 per cent. mortality. A spray of 11 lb. snuff and 50 U.S. gals. water was applied, after filtering the coarse particles out through a cheesecloth, to a young tangerine tree by means of a hand sprayer, and killed 95 per cent. of the Aphids within 24 hours. The mortality was the same when the mixture was used as a dip, the heavily infested twigs being dipped in a beaker until thoroughly wet. In no case where snuff was used either as a dust, spray or dip were the trees or twigs infested severely again before the growth had hardened ; this cannot be said of the ordinary nicotine sulphate dusts or sprays.

YOTHERS (W. W.) & MCBRIDE (O. C.). U.S. Bur. Ent. **Factors affecting the Control of the Green Citrus Aphid with Nicotine Dust.**—*Proc. Florida Hort. Soc. 1926*, xxxix, pp. 169–171. DeLand, Fla., 1926.

Nicotine sulphate dust with hydrated lime as a carrier having proved of value against the green citrus aphis, *Aphis pomi*, DeG.

(*spiraecola*, Patch), tests have been made to determine the effect of different weather conditions on its efficiency. In cold, windy weather, very little mortality resulted (probably not more than 30 per cent.), though 90 lb. of 3 per cent. dust was used on 274 trees. The dust cloud only surrounded the trees for about 2 seconds. In cold and calm weather the dust did not drift further than the second row, but the results were disappointing ; probably about 75 per cent. of the Aphids were killed. As wind cannot have been the cause of failure, the low temperature must have been responsible ; this bears out the finding of other investigators, namely, that below 60° F. little or no nicotine gas is evolved or liberated. Rain in the present case washed off the dust within a few hours, otherwise the results might have been somewhat better. On a warm day (temperature 73 to 75° F.) and in a dead calm, using 240 lb. of dust for about 700 trees, it was observed that the cloud of dust remained for 30 seconds or more round the trees, and examination afterwards showed that very satisfactory results had been obtained ; 98·1 per cent. of the Aphids were killed, and of those found alive on the trees the majority had in all probability flown in from untreated groves. It is considered that much money is probably wasted by carrying out dusting operations while there is any breeze.

McBride (O. C.). U.S. Bur. Ent. **A Leafhopper** (*Eupteryx flavoscuta* **var.** *nigra* **Osb.) attacking the Leather-leaf Fern** (*Polystichum capense*, **J.Sm.**).—*Proc. Florida Hort. Soc. 1926*, xxxix, pp. 224–227. DeLand, Fla., 1926.

Fern growing has become one of the important industries of Florida, and for some years the plants seemed to be immune from insect pests. About three years ago, however, leather-leaf ferns (*Polystichum capense*) were found to be spotted with punctures from which the chlorophyll had been extracted. This damage was caused by the leafhopper, *Eupteryx flavoscuta* var. *nigra*, Osb., which rendered the ferns unmarketable. One grower lost more than £400 in 8 months from this cause. This leafhopper has previously only been recorded on ferns in the wooded areas of the north, in Connecticut, New York, Ohio and Maine. A number of experiments with various remedies are described in detail. Nicotine-lime dust was not effective and left an undesirable lime deposit on the ferns. Calcium cyanide dust gave poor results and slightly injured the ferns. Nicotine sulphate, 1 : 800, with soap did not kill the last two nymphal stages nor the adults. Five per cent. extract of derris, 1 : 800 and 1 : 600, with 2 lb. soap to 50 U.S. gals., gave satisfactory control but was slow in its effect. No leafhoppers were present for 13 days after this spraying, but reinfestation occurred from eggs deposited before the application of the spray. A second application was therefore made, using an angle nozzle at 50 lb. pressure, covering both surfaces of the fronds. At the end of 7 days, only 1 insect was present to each 145 fronds, the mortality being 98 to 99 per cent. A second application of nicotine sulphate (1 : 600 with 2 lb. soap in 50 U.S. gals.) gave 75 to 80 per cent. control. Slight injury was noticed on all sprayed plots, but this was thought to be a mechanical injury and of no commerical importance. The derris spray was cheaper than the nicotine sulphate.

WALDRON (M.). **Dusting of Citrus Trees.**—*Proc. Florida Hort. Soc. 1927*, xl, pp. 69–72. DeLand, Fla., 1927.

The spraying of *Citrus* with lime-sulphur throughout the year, which has been the standard remedy for rust mites [*Phyllocoptes oleivorus*, Ashm.], has largely been replaced by dusting with finely-ground sulphur, but the author recommends retaining one spraying with lime-sulphur shortly after the petals have fallen. This also kills red spider and immature Coccids and has the additional advantage that nicotine sulphate can be added to the spray at the rate of 1 qt. to 200 gals. to control Aphids more economically than by dusting. The essential point of satisfactory dusting seems to be to apply the dust before the mites are numerous enough to be readily seen. One lime-sulphur spray in April, followed by two well-timed dustings, has given almost complete control of mites during the last three years. Nicotine dust has been successfully used against Aphids where there are no air currents, but this condition is almost unknown.

WATSON (J. R.). **The Citrus Aphid Situation.**—*Proc. Florida Hort. Soc. 1927*, xl, pp. 73–77. DeLand, Fla., 1927.

Early frosts in 1927 killed most of the new *Citrus* growth and consequently the majority of the Aphids [*Aphis pomi*, DeG.] were starved to death. The best methods of clearing up Aphid infestations in the groves during the winter are discussed [see preceding papers]. *Spiraea* is considered by far the most important food-plant in carrying this Aphid through the winter, as it can feed on the mature foliage and stems; there are no wild species of *Spiraea* in Florida, and all cultivated ones should be destroyed in the neighbourhood of *Citrus* or sprayed with a 1 per cent. oil emulsion to each 800 parts of which one part of nicotine sulphate has been added. This will kill eggs as well as adults. Eggs were observed to hatch on *Spiraea* [*cf. R.A.E.*, A, xvi, 22]. Pears are also an important food and the addition of 1 part nicotine sulphate to 800 of the 1 per cent. oil emulsion used during the winter against San José scale [*Aspidiotus perniciosus*, Comst.] will kill any Aphid eggs that may be present. *Aphis pomi* is spreading only slowly among Satsuma oranges, and owing to their long dormant season, it does not seem likely that the Aphid will ever become an important pest of these trees; the practice of planting a few ordinary orange trees among them should, however, be discontinued, as infestation frequently spreads from them.

Tests with finely ground tobacco dusts indicate that these may be both successful and economical, but they must be applied when the trees are wet with dew or they will not adhere.

PAPERS NOTICED BY TITLE ONLY.

HOWARD (L. O.). **The Parasite Element of Natural Control of Injurious Insects and its Control by Man.**—*Rep. Smithsonian Instn. 1926*, pp. 411–420. Washington, D.C., 1927. [*Cf. R.A.E.*, A, xiv, 288.]

Rennie (J.). **Crane Fly Grub and the Oat Crop.**—*Scot. J. Agric.*, x, no. 2, pp. 184–195, 1 pl., 4 refs. Edinburgh, April 1927. [See *R.A.E.*, A, xv, 486.]

Franssen (C. J. H.). *Aphis fabae,* **Scop., en aanverwante soorten in Nederland.** [*A. fabae* and related Species in Holland.]—*Tijdschr. Plantenziekt.*, xxxiii, nos. 7–9, pp. 193–282, 2 pls., 4 tables, 70 refs. Amsterdam, July–September 1927. [See *R.A.E.*, A, xv, 464.]

Everts (E.). **Coleoptera in diverse geïmporteerde waren, in Nederland waargenomen.** [(A List of seventy-two) Coleoptera observed in Holland in various imported Goods.]—*Ent. Ber.*, vii, no. 156, pp. 213–219. Amsterdam, 1st July 1927.

Thielebein (O.), Schneider (H.) & Wille (J.). **Das Gebiet des Schadauftretens der Rübenblattwanze,** *Piesma quadrata,* **Fieb., in Mittel- und Ostdeutschland.** [The Regions in Central and Eastern Germany where Injury by the Beet Leaf Bug, *Zosmenus capitatus,* occurs.]—*NachrBl. deuts. PflSchDienst.*, viii, no. 1, pp. 3–5, 1 map, 21 refs. Berlin, January 1928.

Smits van Burgst (C. A. L.). **Lijst van de namen der in Midden- en West-Europa waargenomen parasieten en hyperparasieten van de Gestreepte Dennenrups** (*Panolis griseovariegata,* **Goeze**). [List of the Parasites and Hyperparasites of the Pine Moth, *P. flammea,* Schiff., in Central and Western Europe.]—*Ent. Ber.*, vii, no. 157, pp. 237–240. Amsterdam, 1st September 1927.

[Meĭer (N. F.).] **Мейер (Н. Ф.). Parasites (Ichneumonidae and Braconidae) bred in Russia from Injurious Insects during 1881–1926** [a List arranged under Hosts]. [*In Russian.*]—*Rep. Bur. Appl. Ent.*, iii, no. 1, pp. 75–91, 66 refs. Leningrad, 1927.

Gómez Menor (J.). **Sobre la preparación micrográfica de cochinillas (Cóccidos).** [On the Preparation of Coccids for Microscopy.]—*Bol. Pat. veg. Ent. agríc.*, ii, no. 5–7, pp. 27–29. Madrid, September 1927.

Balachowsky (A.). **Contribution à l'étude des Coccides de l'Afrique mineure. 1re Note.**—*Ann. Soc. ent. Fr.*, xcvi, pt. 2, pp. 175–207, 11 figs., 61 refs. Paris, 1927.

Matsuda (M.). **Studies on the rotatory Movements necessary for the Formation of the Scale in** *Chrysomphalus ficus* (*aonidum*). [*In Japanese.*]—*Trans. Nat. Hist. Soc. Formosa,* xvii, no. 93, pp. 391–417. Taihoku, Formosa, December 1927. (With a Summary in English.)

Kato (M.). **Notes on Formosan Membracidae, with Descriptions of one new Genus and some new Species.** [*In Japanese.*]—*Insect Wld.*, xxxii, no. 1, pp. 2–15. Gifu, January 1928.

Takahashi (R.). **A new Species of Aphididae from Formosa.**—*Trans. Nat. Hist. Soc. Formosa,* xviii, no. 94, pp. 46–48. Taihoku, Formosa, February 1928.

Dozier (H. L.). **Notes on Porto Rican Thysanoptera.**—*J. Dept. Agric. P. Rico,* x (1926), no. 3–4, pp. 279–281. Rio Piedras, P.R., September 1927.

GILLETTE (C. P.), LIST (G. M.) & others. **Seventeenth Annual Report of the State Entomologist of Colorado for 1925.**—*Circ. State Ent. Colorado*, no. 51, 82 pp., 4 pls., 8 figs., 24 refs. Fort Collins, Colo., June 1926.

Some of the information contained in this report has been noticed from other sources. A list of the pests occurring during the year is recorded. *Otiorrhynchus* (*Brachyrhinus*) *rugifrons*, Gyll. (strawberry root weevil), which is reported upon by J. H. Newton, was first recorded in Colorado in 1925. The eggs are laid near the crowns of the plants, and the newly-hatched larvae feed on the roots during the summer and autumn, completing growth during the following spring. Adults of the new generation appear at harvest time. Against the army cutworm, *Chorizagrotis auxiliaris*, Grote, G. S. Langford reports a successful bait consisting of 100 lb. bran (free of shorts), 4 lb. Paris green (or 5 lb. white arsenic), 5 lb. salt, 2 U.S. gals. cheap molasses and 9 to 11 U.S. gals. water. Pupation seemed to occur from 25th April until 19th May or later, the emergence of moths being most abundant from 17th to 22nd June.

Eggs of the codling moth [*Cydia pomonella*, L.] were found by W. P. Yetter, jr., to be parasitised frequently in the summer and autumn by *Trichogramma minutum*, Riley, and it is thought that if the parasites could be kept alive during the winter in a greenhouse, or if they could be kept dormant during the winter in the laboratory and bred out in time to parasitise the first eggs of *C. pomonella* in the spring, a great check on the numbers of this moth might result. During the last two years many aromatic chemicals have been tried as baits in codling moth traps, 29 of which have shown promise. Tests indicated that the use of casein-lime as a spreader in codling moth sprays gave no definite benefit. The effect of different spray schedules on certain varieties of apples is discussed.

Experiments in grasshopper control have been carried on by G. S. Langford and K. D. Arbuthnot, using almost exclusively *Melanoplus femur-rubrum*, DeG. Both sodium fluoride and sodium fluosilicate showed promise in baits, the latter giving high mortality with rapid action and being the less expensive.

Chionaspis salicis-nigrae, Walsh (willow scale), which has been studied by G. S. Langford, is a pest of willow and poplar in Colorado and has also been recorded on a number of other food-plants. The scales cover the twigs, branches and trunks, sometimes killing small trees. Descriptions of the stages are given. There are two generations a year, the winter being passed in the egg stage beneath the old female scale. These eggs hatch in late April or early May. By 18th June, females were found to be fully developed and the males had emerged; oviposition began on 22nd June and lasted about 8 days. By July, almost all females had ceased oviposition and dried up. The second generation larvae began to appear on 8th July, and the development of the scales occupied from 10 to 15 days. The females matured in late August, and oviposition was complete by October. The immature stages are evidently capable of crawling considerable distances, scales having been found on isolated trees as far as six feet from the initial centre of infestation. The Coccinellid, *Chilocorus bivulnerus*, Muls., is predacious on the young scales, and evidences of internal parasites have been found.

Back (E. A.) & Cotton (R. T.). **Insect Control in Upholstered Furniture.**—*Furnit. Warehouseman*, vi, no. 5, reprint, 7 pp., 11 figs. May 1926.

Anthrenus fasciatus, Hbst., and *A. seminiveus*, Casey (carpet beetles) and *Tineola bisselliella*, Humm. (webbing clothes moth), unlike the majority of pests infesting furniture, which are vegetable feeders and do not injure the leather and woollen covers except by chance, actually devour the stuffing and covers and greatly depreciate the value of furniture put into storage. Carpet beetles normally feed on materials of animal origin, eating the pile off mohair, destroying the stuffing so as to leave a flabby appearance, and making holes in the covers. Covers made of cotton are, however, only attacked in order that an exit may be made. These beetles are not a serious menace to furniture except locally in Washington, D.C., although it is thought that they may ultimately become widely distributed throughout America.

Of the two species of clothes moth most widely known in the country *T. bisselliella* is the worst pest of upholstered furniture; it attacks a wide range of materials, both raw and manufactured. Various facts concerning its life-history are given. The shortest period observed from oviposition to the emergence of the adult was 55 days, the average being 65–90 days under favourable conditions in summer. The longest development lasted nearly four years; oviposition took place in August 1922, and the larva fed until the winter set in and again during the summer of 1923; by September a resting cocoon was formed in which the larva remained inactive without food until January 1926, after which it resumed its normal feeding habits. The ability of larvae to go into a resting cocoon and refrain from feeding for long intervals results in great variation in the length of the period of development; 11 months is a fairly usual period for this resting stage. On being disturbed, resting larvae will often crawl from their cocoons and resume feeding or, after a time, die. The fully grown larva spins a tough cocoon for pupation. During the periods of the year when moths are active, hatching occurs in from 4 to 10 days; if the temperature is too low for hatching to occur within 10 to 20 days, oviposition does not as a rule take place. The pupal stage normally lasts 8 to 10 days in summer and about 4 weeks in steam-heated rooms in winter. Mating occurs as soon as the moths emerge, and eggs may be laid within 24 hours, one individual being capable of laying as many as 150; death rapidly follows on completion of oviposition, adults rarely living longer than a month. It is probable that a large amount of furniture is infested after it has been made, the eggs being laid in the pile or in the crevices between two pieces of covering. The manner in which the larvae damage the furniture is described. Both larvae and adults quite frequently leave infested furniture in the warehouse, and articles that were previously uninfested thus become attacked.

Five different forms of control for insect pests in furniture are discussed. The vacuum treatment recommended has already been noticed [*R.A.E.*, A, xiv, 249], and dry cleaning with petrol has been found to be of considerable value. Furniture pests exposed to a temperature of 125–140° F. are killed if the heat can be applied long enough to penetrate to the centre of the infested articles. The cold of winter is also an effective control of furniture pests, exposure to a temperature below 5° F. killing eggs and adults of *T. bisselliella* in 1 day and larvae in 2 days, and 5–10° killing the larvae in 3 weeks. Larvae, pupae and adults of *Anthrenus fasciatus* are killed within 1 day at a temperature below 10°. It is, however, believed by the authors that fumigation is the best means of control under warehouse conditions; this should be carried out at a temperature of over 65° F., preferably at 70–75°, as the insects are most easily killed by fumigants when they are active, and are quite sluggish between 55–65° F. The most usual reasons for the failure of fumigation are discussed. Hydrocyanic acid gas is probably the best fumigant. Exposures to fumigation should last as long as possible; 6 hours is the suggested period, though overnight fumigation is better, while leather covered furniture should be given at least 24 hours unless the covering has first been loosened. The gas may conveniently be generated from calcium cyanide, sufficient tests having been carried out to convince the authors of its effectiveness. The powder may be used at the rate of 8–16 oz. to 1,000 cu. ft. of space.

McAtee (W. L.). **The Relation of Birds to Woodlots in New York State.**—*Roosevelt Wild Life Bull.*, iv, no. 1, pp. 7–152, 4 pls., 22 figs., 5 pp. refs. Syracuse, N.Y., October 1926.

New York State contains many small woodland areas amounting in all to about four million acres. These form an important part of the forest resources of the State, and all factors influencing their welfare should be given careful consideration. A large section of the present bulletin deals with the insect pests found in such woods and their bird enemies, which are of the greatest value in keeping down their numbers. It is urged that every effect should be made to encourage and protect the birds by providing nesting boxes wherever possible and by maintaining a water and food supply for them, especially in the winter.

Perennial Canker Mysteries Solved.—*Better Fruit*, xxii, no. 3, pp. 5–6. Portland, Ore., September 1927.

Experiments carried out by L. Childs in the Hood River Valley, Oregon, have proved that perennial canker in apple trees [caused by *Gloeosporium perennans*] is definitely associated with the woolly aphis [*Eriosoma lanigerum*, Hausm.]. The knotty galls formed by the work of the Aphids on the cambium are apparently cells or blisters filled with water. During the winter the alternate freezing and thawing of the water causes them to rupture so that the spores of the fungus are able to enter and spread. The latter never attacks healthy limbs, and only occurs in wounds caused by pruning or some other injury as a result of the work of the Aphids at their edges. During the mild winter of 1925 very little infection occurred in spite of the presence of the Aphids. As the disease is favoured by cold weather, it is recommended that pruning should not be done at such a time. The attacked portion of the tree should be cut out and the wound painted; of various paints tried the best results were obtained with one containing copper sulphate, resin and fish-oil. Paints containing either white lead or Bordeaux mixture were not effective, while coal-tar paints were only of use for a short time.

Huckett (H. C.). **Spraying and Dusting Experiments with Potatoes on Long Island in 1926.**—*Circ. N. Y. Agric. Expt. Sta.*, no. 90, 10 pp., 2 pls. Geneva, N.Y., 1st January 1927.

The results of spraying and dusting experiments on potatoes on Long Island in 1926, when leafhoppers and flea-beetles were the chief pests, are reviewed. The most serious damage due to these insects was the premature destruction of the foliage during early August; in spite of this, however, the yield of tubers was unusually good, indicating the contrary of the usually accepted theory that severe foliage injury results in serious decline in the crop. Where insect injury was the chief factor limiting production, spraying and dusting served to increase the average yield, but the usual practice (using 2 nozzles to the row and about 75 U.S. gals. of spray to the acre) was not sufficient to prevent destruction of the foliage. The relative value of various types of spraying equipment are compared; it is thought that the effectiveness of Bordeaux sprays as regards leafhoppers is greatly improved by attaching a board to the spray platform during early July, so that it brushes over the plants before the spray reaches them. Early applications of spray and dust containing arsenicals were made against the first generation of flea-beetles, and this reduced the degree of injury by the second generation. Spraying on the whole gave much better protection to foliage than dusting, probably largely on account of the frequency with which dust was washed off by rain almost immediately after the application.

Hinds (W. E.) & Spencer (H.). **Department of Entomology.**—*Ann. Rep. Agric. Expt. Sta. Louisiana 1926*, pp. 92–104. Baton Rouge, La. [1927].

Most of this report is devoted to work against *Diatraea crambidoides* that has already been noticed [*R.A.E.*, A, xv, 440, 505].

Smith (C. E.) & Allen (N.). U.S. Bur. Ent. **Projects of Investigations affecting Truck Crops in Louisiana, 1926.**—*Ann. Rep. Agric. Expt. Sta. Louisiana 1926*, pp. 120–122. Baton Rouge, La. [1927].

Studies of the spotted cucumber beetle [*Diabrotica duodecimpunctata*, F.] in Louisiana indicate that there is only one principal generation in a year. The worst damage done by the adults occurs in the winter and early spring. The larvae are also injurious in early spring. Experiments with sodium fluosilicate as an insecticide were promising.

Against the tomato fruitworm [*Heliothis obsoleta*, F.] moderate success was obtained with lead arsenate and calcium arsenate, but sodium fluosilicate was unsatisfactory, as effective strengths injured the tomato foliage and fruits. Several parasites and predators reduce the numbers, and a fungus, *Entomophthora* sp., was also a considerable check. Various baits and light traps were tried without success.

Smith (R. C.). **Insect Enemies of Alfalfa.**—*Bull. Kans. Agric. Expt. Sta.*, no. 242, pp. 36–40. Manhattan, Kansas, September 1927.

Grasshoppers are the most serious pests of lucerne in Kansas. The formula for Kansas bait is given, and the manner in which it should be mixed and distributed are discussed [*R.A.E.*, A, ii, 249]; the best results may be obtained after one crop has been removed and before the next has started, while considerable material may be saved by leaving a space 20–30 ft. wide between the strips of mash. Sodium arsenate at the rate of ¼ U.S. pint to 20 or 25 lb. bran may be substituted for the regular mash, and amyl acetate at the rate of 1–2 oz. to 20 lb. bran may be used instead of the fruit, and should be poured into the water before wetting the bran. The hopperdozer is also a useful method of control when the lucerne is not too tall, especially during June and July.

Cutworms occasionally occur in great numbers and do serious damage; the army cutworm [*Chorizagrotis auxiliaris*, Grote] causes the greatest damage in early spring to crops sown the previous autumn and is generally first reported from wheat, or from lucerne fields where there is self-sown wheat, while the variegated cutworm [*Lycophotia margaritosa*, Grote] feeds on the young growth after the first cutting. The bait recommended above should be scattered under piles of hay during the first cutting, since the caterpillars crawl under the hay for protection and are thus easily poisoned; the mash may also be broadcast on standing lucerne or stubble, but if this is done, two applications are usually necessary.

The army worms [*Cirphis unipuncta*, Haw., and *Laphygma frugiperda*, S. & A.] eat the foliage and strip the stalks in their migration across the fields; the same bait may again be used and should be applied in the afternoon of cool days or the early evening of very warm ones.

The corn ear-worm [*Heliothis obsoleta*, F.] is present in the lucerne fields throughout the summer, but since it primarily attacks maize, is most numerous early in the year before the maize is ripe enough to be attractive. This pest may also be controlled by the same bait, and lucerne should be cut as soon as injury is observed, so that the larvae are killed as they search for new sources of food.

The pea aphis [*Macrosiphum pisi*, Kalt.] [*R.A.E.*, A, xiv, 528] may be easily controlled if it is observed before much damage has been done by applications of calcium cyanide granules at the rate of 25–30 lb. to the acre. The material should not be applied when plants are damp, and the best results may be obtained when the temperature is about 70° F. The whole of the injured area need not be covered, since the infestation is heaviest in a border about 6 ft. wide around it. The best results may be obtained by dragging a pole over the dusted area so that the Aphids are knocked to the ground and come into close contact with the poison.

The garden webworm [*Loxostege similalis*, Gn.] occasionally occurs in sufficient numbers to injure the second or third cutting of hay to a serious extent; if it is observed doing severe injury the lucerne should be cut.

A few other insects are recorded as occasional pests of minor importance.

PARROTT (P. J.). **Progress Report on Light Traps for Insect Control.**—12 pp. New York, N.Y., Empire State Gas & Elect. Ass., October 1927.

The results of the first season's work with light traps in New York showed that while a large variety of species of economic importance was captured, only a few destructive insects were taken in large numbers. All the Lepidoptera, which represented 29·6 per cent. of the season's catch, most of the Coleoptera and Rhynchota, and a smaller percentage of the Diptera and Hymenoptera were injurious species. Not more than 3 or 4 per cent. of the insects taken, however, were distinctly beneficial, the remainder being either harmful or neutral. The traps used in these experiments consisted of a galvanised iron pan with a socket for an electric bulb fastened at the intersection of two metal bails with an iron hook at their point of intersection by which the pan was suspended. A telegraph pole with 2 cross-arms, each bearing a trap at either end, comprised a complete pole unit for field use. Acetylene lamps were used in some tests in the absence of electric power.

Of the ten different types of bulbs used, varying from 25 to 200 watts, those of lower power at 6½ ft. often attracted more insects than a slightly stronger bulb at 13 ft., and where all the bulbs were at the same power the lower traps were usually more attractive. The addition of baits, such as molasses and water, proved to be a strong attractant, so that a 25 watt frosted bulb, with the addition of a bait, attracted more than double the number of insects captured with a 200 watt clear bulb without bait.

The most significant of the insects caught were the fruit-tree leaf-roller [*Tortrix argyrospila*, Walk.] and other Tortricids, Tineids, cutworm moths, Geometrids, leafhoppers, plant bugs and the round-headed apple tree borer [*Saperda candida*, F.]. The largest catches of *T. argyrospila* were made in a hot, humid atmosphere with a temperature between 60° and 65° F., a reduction in the number occurring with a cooler effective temperature and a higher dry bulb temperature. Catches of codling moth [*Cydia pomonella*, L.], compared with the probable number of moths present in the orchard and the extent of injury to the apple crop, were small. *C. pomonella* proved for the most part negatively phototropic in the orchard, though in cold storage houses, where it represented 55 per cent. of the total number of insects captured, it proved positively phototropic. The results secured with light traps in cold storage houses appeared to show that almost complete control of this pest may be secured by this method.

Experiments carried out with a number of insects, including apple tent caterpillars and moths [*Malacosoma americana*, F.] and adults of the European corn borer [*Pyrausta nubilalis*, Hb.], ermine moths [*Hyponomeuta malinellus*, Zell.] and *Cydia pomonella*, L., to determine their colour preferences showed that these insects were as a general rule negatively phototropic where colours at the red end of the visible spectrum were used, that their response was more positive at the violet end, and that where a free choice of colours was allowed, light yellow and very light blue-green, and red purple and blue purple proved the more attractive filters.

INDA (J. R.). **Plaga y enfermedades del garbanzo.** [Pests and Diseases of the Chick-pea.]—*Mem. Rev. Soc. cient. "Antonio Alzate,"* xlvii, no. 1–4, pp. 43–53. Mexico, January–April 1927.

Chick-peas [*Cicer arietinum*], which are widely grown in Mexico, are attacked by the Noctuids, *Lycophotia* (*Peridroma*) *margaritosa*, Haw., and *Heliothis obsoleta*, F.; grasshoppers of the genus *Melanoplus*; the Aphid, *Macrosiphum pisi*, Kalt.; and *Bruchus quadrimaculatus*, F., and *B. obtectus*, F., which are found both in the field and in stores.

The usual measures against these pests are recommended, the spray suggested against the Noctuid larvae consisting of 10 lb. lead arsenate to 100 gals. water.

DOZIER (H. L.). **Some New and Interesting Porto Rican Leafhoppers.**—*J. Dept. Agric. P. Rico*, x (1926), no. 3–4, pp. 259–265, 4 figs. Rio Piedros, P.R., September 1927.

This paper includes descriptions of the following Jassids: *Protalebra tabeduiae*, sp. n., on *Tabeduia pallida*, a common shade and timber tree in Porto Rico; *P. similis*, Baker, on sweet potato; *P. brasiliensis*, Baker, previously recorded as *Erythroneura comes*, Say [*R.A.E.*, A, x, 97], on sugar-cane; *Empoasca minuenda*, Ball, on avocado; *Dikraneura depressa*, McAtee, on *Thespesia grandiflora*; and *Cicadella coffeaphila*, sp. n., and *C. coffeacola*, sp. n., both of which have been recorded as *Tettigonia occatoria*, Say [*loc. cit.*], on coffee and other plants.

DOZIER (H. L.). **Notes on Porto Rican Scale Parasites.**—*J. Dept. Agric. P. Rico*, x (1926), no. 3–4, pp. 267–277, 11 figs. Rio Piedras, P.R., September 1927.

Notes are given on the following parasites of scale insects in Porto Rico: *Leptomastix dactylopii*, Howard, which is re-described, *Achrysopophagus seini*, sp. n., *A. gahani*, sp. n., *Thysanus niger*, Ashm., and *T. bifasciatus*, Ashm., all reared from *Pseudococcus citri*, Risso, the last four being probably hyperparasites; *T. flavus*, reared from material infested with *Aleurothrixus howardi*, Quaint.; *Lecaniobius cockerelli*, Ashm., and *Eupelmus saisetiae*, Silv., from *Saissetia oleae*, Bern.; *Pseudopteroptrix imitatrix*, Fullaway, from *Howardia biclavis*, Comst.; *Plagiomerus cyaneus*, Ashm., from *Ceroplastes cirripediformis*, Comst., *Aspidiotus cyanophylli*, Sign., and *Aleurothrixus howardi*, Quaint.; *Aspidiotiphagus citrinus*, Craw, from *Asterolecanium pustulans*, Ckll., *Diaspis careuli*, Targ., and *Chrysomphalus tenebricosus*, Comst.; and *A. lounsburyi*, Berl. & Paoli, from *Aspidiotus destructor*, Sign., *Aulacaspis* (*Diaspis*) *pentagona*, Targ., and *C. dictyospermi*, Morg. The last three parasites are re-described.

PICKEL (B.). **Os parasitos do cafeeiro no Estado da Parahyba. Um novo parasito do cafeeiro, o piolho branco,** *Rhizoecus lendea* **n. sp.** [Coffee Pests in the State of Parahyba. A new Pest of Coffee, the White Scale, *R. lendea*, sp. n.]—*Chacaras e Quintaes*, xxxvi, no. 6, pp. 587–593, 7 figs. S. Paulo, 15th December 1927.

Coffee in Parahyba is attacked by the Coccids, *Cerococcus parahybensis*, Hemp., *Pseudococcus citri*, Risso, *Rhizoecus lendea*, sp. n., *Saissetia oleae*, Bern., and *Alecanochiton marquesi*, Hemp.; the Tineid, *Leucoptera coffeella*, Guér.; and an ant, *Acropyga pickeli*, Borgmeier (M.S.), which fosters *R. lendea*. The first three Coccids are described. *R. lendea* is the important pest of coffee and also occurs on bananas. It infests the roots, and control is best effected by destroying or driving away the ants that tend it. Ants' nests at the roots of the bushes may be destroyed by watering with potassium cyanide, 1 lb. in 4 gals. water. A contact insecticide against the scale may be added to the poison. *C. parahybensis* is best combated in winter by scraping the stems and then spraying.

Lahille (F.). **El método biológico de lucha contra las plagas.** [The biological Control of Pests.]—*Rev. Fac. Agron. Vet.*, vi, no. 1, pp. 50–72, 19 refs. Buenos Aires, October 1927.

The various factors involved in the biological control of insect pests are discussed, and instances where this method has not been successful in Argentina are quoted.

Box (H. E.). **Apuntes preliminares respecto al descubrimento de algunos parásitos de los huevos de *Diatraea saccharalis* en Tucumán.** [Preliminary Notes on the Discovery of some Parasites of the Eggs of *D. saccharalis* in Tucumán.]—*Rev. ind. agric. Tucumán*, xviii, no. 1–2, pp. 5–8, 2 figs. Buenos Aires, June–July 1927.

It has been suggested that egg-parasites of the sugar-cane moth borer, *Diatraea saccharalis*, F., should be introduced into the sugar-cane areas of Argentina, but just prior to the publication of these notes two such parasites, a Chalcid, probably *Trichogramma minutum*, Riley, and a Proctotrupid, possibly *Prophanurus alecto*, Crawf., have been discovered in the province of Tucumán, the former being sufficiently abundant and widespread to be of considerable value. Parasites also occur in the provinces of Salta and Jujuy. In Tucumán the Hesperiid, *Calpodes ethlius*, Cram., is another host of *Trichogramma*.

Marelli (C. A.). **Importancia de investigar en la Argentina los parásitos de *Lema bilineata*, Germar, convertida en peste de las plantaciones de tabaco en Sud Africa y su posible aclimatación en aquellos estados.** [The Importance of investigating in Argentina the Parasites of *L. bilineata* and their possible Acclimatisation in South Africa where it has become a Pest of Tobacco.]—*Rev. Soc. ent. Argent.*, ii, no. 4, pp. 47–54, 2 figs., 17 refs. Buenos Aires, 1st November 1927.

Information taken from previous papers is given on *Lema bilineata*, Germ., in Argentina and South Africa [*R.A.E.*, A, vii, 318; ix, 186]. The Division of Entomology, Pretoria, is considering the possibility of importing parasites of this beetle, which is a serious pest of tobacco in South Africa, while it is of no economic importance in Argentina, where it is indigenous.

Dallas (E. D.). **Nota sobre un coleóptero paleárctico introducido en la R. Argentina.** [A Palaearctic Beetle introduced into the Argentine Republic.]—*Rev. Soc. ent. Argent.*, ii, no. 4, pp. 73–74, 1 fig. Buenos Aires, 1st November 1927.

A weevil, *Brachycerus* sp., is recorded in Argentina from a bulb of garlic (*Allium sativum*). Larvae of this genus infest garlic bulbs in southern Europe.

GUIMARÃES (R. F.). **Uma praga que ameaça a cultura da batatinha,** *Solanum tuberosum*, **L.,** *Lycopersicum tuberosum*, **Mill.,** *Papas peruvanum*, **Claus.** [A Pest threatening the Cultivation of the Potato.]—*Bol. Agric.*, xxviii, no. 9–10, pp. 533–541, 3 figs. S. Paulo, September–October 1927.

Shipments of potatoes infested by the potato moth, *Phthorimaea operculella*, Zell., having been received at the port of Santos, a regulation has been issued that potatoes from other states of Brazil or from abroad can only be imported through that port.

GOLDSTEIN (B.). **An** *Empusa* **Disease of** *Drosophila*.—*Mycologia*, xix, pt. 3, pp. 97–109, 3 pls. Lancaster, Pa., 1927. (Abstract in *Rev. Appl. Mycol.*, vi, no. 12, p. 725. Kew, Surrey, December 1927.)

Outbreaks of a disease of *Drosophila repleta*, Woll., and to a smaller extent of *D. melanogaster*, Mg., which have occurred during recent years at Columbia University, New York, are stated to be due to a fungus of the genus *Empusa*, identical in structural details with *E. muscae*. Its cytology is described in detail, and the classification of the genera of the parasitic Entomophthoraceae is discussed.

AINSLIE (G. G.). **The Larger Sod Webworm.**—*Tech. Bull. U.S. Dept. Agric.*, no. 31, 17 pp., 2 figs., 21 refs. Washington, D.C., November 1927.

Crambus trisectus, Wlk. (larger sod webworm) causes frequent and serious damage to meadow and pasture lands and to young maize, its natural food-plants being native grasses. It is widespread throughout the northern United States, particularly in the section from Ohio to Iowa. There are generally two generations a year, with possibly a small or partial third one at its southern limits. In Iowa the life-cycle averages about 50 days in summer. The moths drop their eggs among grasses, generally during flight at dusk. The larvae hatch in about a week, and construct tubular burrows of silk and earth among the grass roots, on or just beneath the ground surface, emerging at night to feed. Four or five such burrows radiating from the base of a plant may be made by one larva, its presence being recognised by the short stubs of grass blades cut at the characteristic angle of 45°. The overwintering larvae hibernate among the grass roots in silken cocoons; they emerge in April and May and feed ravenously until mature, when a cell is formed in the ground close to the feeding tunnels, in which pupation occurs. Maize is attacked by the larvae soon after it appears above ground. The moths emerge in May and early June, the larvae of the second generation being most injurious to grass and pasture lands during July, especially in dry seasons. They reach the adult stage in mid-August. All the stages of the insect, including the eight larval instars, are described. Besides such enemies as insectivorous birds and mammals, the larvae are attacked by insect parasites. From a batch of *C. trisectus* including some individuals of *C. mutabilis*, Clem., both of which species had been concerned in an outbreak on maize in Indiana, were reared the Tachinids, *Phorocera claripennis*, Macq., and *Exorista nigripalpis*, Towns., the Braconids, *Macrocentrus* sp. and *Orgilus detectiformis*, Vier., and the Ichneumonids, *Angitia obscura*, Cress., and *Cymodusa* sp. *Ephialtes aequalis*, Prov., and *Apanteles crambi*, Weed, have been recorded from *C. trisectus* by previous workers.

When the larvae are very abundant in maize, it is best to re-plant, placing the new rows between the old ones and leaving the infested plants as long as possible, so that the webworms will complete growth on them without attacking the new young plants. The moths emerging from the larvae in the old plants will seek grassy places and will not oviposit among the new maize. Poison baits have been tried in infested maize without success. As preventive measures, early autumn ploughing and rotation of crops are recommended [*R.A.E.*, A, x, 248 ; xii, 221].

Campbell (R. E.). U.S. Bur. Ent. **The Celery Leaf-tyer,** *Phlyctaenia rubigalis*, **Guen., in California** (**Lep.**).—*Pan-Pacific Ent.*, iv, no. 2, pp. 77–84, 10 refs. San Francisco, Cal., October 1927.

Phlyctaenia rubigalis, Gn. (celery leaf-tyer), which is a common greenhouse pest in the United States, also attacks several outdoor crops, chiefly celery and sugar-beet, in California [*R.A.E.*, A, xiii, 247]. It is not an important pest of beet, though it destroys a large amount of foliage, as the plants are usually well grown before being attacked, and their foliage is so heavy that moderate damage to it does not affect the crop. It is, however, a serious pest of celery, and a reduction in the area of celery cultivated in one district of California from about 7,000 acres in 1911 to less than 200 acres in 1916 was estimated to be due to it to the extent of 25 per cent., and a considerable acreage in another district has been subject to severe injury from it.

The history of this moth as an outdoor pest is briefly reviewed, with a description of all its stages, and its distribution in the United States is discussed. During the winter it requires over three months to complete a generation from oviposition to emergence of adult, in spring and autumn about two months, and in summer a little more than one. The egg stage varies from 4 days with an average temperature of 70° F. to 30 days with an average temperature of 50° F., the larval stage from 21 to 68 days, the prepupal stage from 2 to 10, and the pupal stage from 6 to 37. In captivity the adults lived from 6 to 34 days. The eggs are laid on the lower surface of the leaves, singly or in masses of from 3 to 12, the number of eggs laid by one female averaging 130. The larva at first eats the lower surface of the leaf, subsequently joining two or more leaves with a silken web, within which it continues to feed and grow and finally pupates. When only a few larvae are present, little damage is done, but where they are numerous, the leaves are skeletonised and in severe attacks the plants are defoliated. The larvae also make their way into the heart of the plant, eating irregular cavities in the stems and rendering the celery unsightly. The adults remain in hiding on the lower surface of the leaf during the day, flying about sunset and through the early evening. Life-history studies carried out through three seasons indicate that there may be a maximum of 5 or 6 generations a year, 3 or 4 occurring between June and December, when the active growing season for celery occurs. There is considerable overlapping, and the generations are too indistinct for recognition in the field.

In spring *P. rubigalis* is scarce in California, and after 1st March, before which date the main celery crop is harvested, the larvae live in late or abandoned fields or in beet fields. As soon as the beets are harvested, the moths migrate once more to the celery fields, where important infestation begins in late August or early September, cool weather in November usually retarding the growth of the larvae and reducing their numbers. By December and January the larvae become scarce, and very few can be found in February or March. *P. rubigalis* is more plentiful and causes more injury during a warm dry season than during one with early rains and a cool autumn. As the main celery crop is transplanted in July and August and develops little during the first month in the field, its growth is materially checked by leaf-tyer infestation. Early planted celery receives most damage, while that planted later, though injured at first, has more opportunity to recover. Of numerous natural enemies of *P. rubigalis* taken in the field [*R.A.E.*, A, xi, 84], the most common internal Hymenopterous parasite found was *Rhogas rufocoxalis*, Gahan.

DOANE (R. W.) & STEINWEDEN (J. B.). **A new *Ripersia* (Homop.) attacking Wheat.**—*Pan-Pacific Ent.*, iv, no. 2, pp. 85–86. San Francisco, Cal., October 1927.

The Coccid, *Ripersia arenaria*, sp. n., infesting the roots of wheat and June grass (*Bromus arenarius*), which is probably its native food-plant, is described from Utah. From 75 to 80 per cent. of wheat plants growing near badly infested June grass showed some infestation. The economic importance of this species is at present undetermined.

HARDY (G. A.) & PREECE (W. H. A.). **Notes on some Species of Cerambycidae (Col.) from the southern portion of Vancouver Island, B.C.**—*Pan-Pacific Ent.*, iii, no. 1, pp. 34–40; no. 4, pp. 187–190; iv, no. 2, pp. 61–67. San Francisco, Cal., July 1926, April & October 1927.

Longicorns recorded from the south of Vancouver Island from 1924 to 1927 include the following species attacking Douglas fir, *Pseudotsuga taxifolia* (*mucronata*): *Ergates spiculatus*, Lec., in railway sleepers; *Opsimus quadrilineatus*, Mann., under the bark of a dead tree; *Tetropium velutinum*, Lec., *Strangalia obliterata*, Hald., *Xylotrechus undulatus*, Say, *Xestoleptura crassipes*, Lec., and *Nothorhina aspera*, Lec., in stumps; *Eumicthus oedipus*, Lec., and *Molorchus longicollis*, Lec., in boughs; *Stenocorus vestitus*, Hald., in underground roots of dead trees; *Callidium vancouverense*, V.D., in sapwood and heartwood in slash piles; and *Phymatodes aeneus*, Lec., a sub-cortical borer found in slash and small stumps and trunks of dead trees.

Beetles attacking balsam (*Abies grandis*) include: *Rhagium lineatum*, Oliv., *Ulochaetes leoninus*, Lec., and *O. quadrilineatus* from beneath the bark of dead trees; *Xestoleptura crassipes*, Lec., in the heartwood of old stumps; *Prionus californicus*, Mots., in fence posts; and *Strangalia obliterata* in dead trees. *Anocomis* (*Semanotus*) *lignea*, F., was found in *Thuja plicata* (giant cedar); *Leptura matthewsi*, Lec., in stumps of *T. plicata*; *O. quadrilineatus* in *Pinus contorta* (bull pine);

Saperda calcarata, Say, in *Populus tremuloides* (aspen), the larvae working only in living trees; and *Phymatodes vulneratus*, Lec., in *Acer macrophyllum*.

FRACKER (S. B.). **Division of Insect and Plant Disease Control.**—*Bienn. Rep. Wisc. Dept. Agric. 1925–26*, Bull. 82, pp. 49–96, 7 figs. Madison, Wisc., June 1927.

The most important extension of the work of the Division during the two years under review was the establishment of a cranberry insect and plant disease control service. During 1926 only a small amount of insect damage was done to this crop, the pests recorded being the blackhead fireworm [*Rhopobota naevana*, Hb.] and the cranberry fruit-worm [*Mineola vaccinii*, Riley].

Raspberries in almost every nursery in Wisconsin were infested with some form of mosaic, although the prevalence of severe types has been greatly reduced. There is positive evidence that important pests have been introduced into greenhouses from outside the State, and as the nursery inspection law does not cover greenhouse roses and other plants, it is recommended that some action be taken to protect the interests of florists. *Neocerata* (*Dasyneura*) *rhodophaga*, Coq. (rose midge) was introduced on rose stock and caused about £2,000 worth of damage in one nursery, while greenhouses repeatedly become infested with the cyclamen mite [*Tarsonemus pallidus*, Banks] and the chrysanthemum midge [*Diarthronomyia hypogaea*, Lw.]. Insect pests of nursery stock included *Aspidiotus perniciosus*, Comst. (San José scale), *Gossyparia spuria*, Mod. (European elm scale) and *Cryptorrhynchus lapathi*, L. (imported poplar weevil). A detailed account is given of an outbreak of *Ellopia fiscellaria*, Gn. (hemlock spanworm) [*R.A.E.*, A, xv, 294].

The situation with regard to *Pyrausta nubilalis*, Hb. (European corn borer) and *Hypera variabilis*, Hbst. (*Phytonomus posticus*, Gyll.) (alfalfa weevil), which do not yet occur in Wisconsin, is discussed, and the text of quarantines against them is given [*cf. R.A.E.*, A, xv, 135, 501].

A list is given of the insect pests recorded during the period under review, showing the plants attacked and localities infested.

MILLER (I. M.). **New Tactics suggested in Moth War.**—*Better Fruit*, xxii, no. 6, pp. 9–10. Portland, Ore., December 1927.

This review of the situation in regard to *Cydia* (*Carpocapsa*) *pomonella*, L. (codling moth) in the United States points out the failure of arsenical sprays as a method of control, and advocates the use of biological methods to keep the moth in check. It is stated that birds, which eat from 66 to 85 per cent. of the hibernating larvae, are actually kept from orchards by the use of sprays. Observations in the Yakima Valley (Washington) have shown that bats eat *C. pomonella*, and wing scales of moths were found in microscopical examinations of their stomach contents. In an orchard where a colony of 500 bats had been established a reduction of infested fruit from 30 per cent. in 1924 to only two apples in 1927 was effected. Bats may be colonised by the establishment of bat roosts, the construction and cost of which are briefly discussed.

Knowlton (G. F.). **The Beet Leafhopper and the Curly-top Situation in Utah.**—*Circ. Utah Agric. Expt. Sta.*, no. 65, 12 pp., 6 figs., 15 refs. Logan, Utah, May 1927.

The relation of *Eutettix tenella*, Baker (beet leafhopper) to curly-top disease is discussed with special reference to the situation in Utah. Of the areas in the State on which beet is extensively grown, there are only a few in which the disease does serious damage every year, the greater part being generally free from it, although in 1926 an outbreak caused a loss of over £400,000, and in 1926 the loss was even greater. *E. tenella* is principally distributed over the less arid parts of the western United States, and the disease generally corresponds with the western range of the leafhoppers. In certain years the pest spreads beyond its normal range, though it may be unable to maintain itself in the new area. The leafhopper has a large variety of food-plants, most of which are weeds. The principal food-plant in Utah is Russian thistle (*Salsola pestifer*), and almost all the plants of this species examined in the State were found to be infested. In Utah *E. tenella* may have two generations a year. No means of control have been found to be effective, but there is a possibility that a strain of beets resistant to curly-top may be produced [*R.A.E.*, A, xiv, 165].

Needham (J. G.) & Christenson (R. O.). **Economic Insects in some Streams of northern Utah.**—*Bull. Utah Agric. Expt. Sta.*, no. 201, 36 pp., 44 figs., 1 ref. Logan, Utah, April 1927.

This is an account of the aquatic insects of the Logan River and other streams in northern Utah, the object of the investigation being to determine the types of insects, both phytophagous and predacious, present and their relative abundance, in view of their importance in relation to trout. The nymphs of mayflies (Ephemeroptera), which are entirely herbivorous, are predominant in the Logan River and are of most importance, as trout feed principally on phytophagous insects.

Buchner (P.). **Holznahrung und Symbiose.** [Wood Diet and Symbiosis.]—8vo, 64 pp., 22 figs. Berlin, J. Springer, 1928. Price *M*.4.50.

This is a comprehensive survey of the symbiotic adaptations of various insects feeding on wood and other substances rich in cellulose. The observations of previous workers are summarised and collated, and some original results on certain insects are communicated. Special organs that harbour a fungus and provide for its transmission to the offspring are described in *Sirex* and *Xiphydria*; ORYSSINAE have no symbionts, and this is in accordance with their parasitic habits. Special appendages of the mid-intestine, filled with symbiotic bacteria, occur in a number of wood-boring Longicorns, in various Curculionids (*Hylobius*, *Pissodes*, *Cionus*, CLEONINAE), and in Buprestids. Symbionts, of apparently digestive function, have been found in larvae of various Trypetids.

Merket (H. H.). **Rüsselkäferbekämpfung.** [Measures against Weevils.]—*Deuts. Forstztg.*, xlii, pp. 397–398, 1927. (Abstract in *Centralbl. Bakt.*, (2) lxxiii, no. 8–14, p. 292. Jena, 20th January 1928.)

Excellent results are obtained with a new method of trapping *Hylobius abietis*. Small pine stems sawn into 16-inch lengths are split up and then tied in bundles of about 4 inches in diameter. These bundles are laid down at the rate of 240 to the acre on the north side of stones or small plants. Every second day the weevils are collected by shaking the bundles, which must be renewed every 15 days.

SCHMIDT (M.). **Ein Massenvorkommen von** *Agrotis praecox*, **L. (Lep., Noct.) in einer Spargelanlage.** [An Outbreak of *Lycophotia praecox* in an Asparagus Plantation.]—*Z. wiss. InsektBiol.*, xxiii, no. 1–2, pp. 52–53. Berlin, 31st January 1928.

The larvae of the Noctuid, *Lycophotia* (*Agrotis*) *praecox*, L., are recorded in large numbers from a plantation of asparagus in North Germany. The plants were growing on sand, and neighbouring plantations were not affected. Collection every night from 10 p.m. to 1 a.m. was resorted to with success. *L. praecox* has not previously been recorded as a pest of cultivated plants ; it normally occurs on sandy ground on various weeds.

SPEYER (W.). **Erfahrungen bei der Bekämpfung des Apfelblattsaugers an der Niederelbe.** [Experiences in the Control of the Apple Leaf-sucker on the Lower Elbe.]—*Anz. Schädlingsk.*, iv, no. 1, pp. 1–6, 9 figs., 9 refs. Berlin, 15th January 1928.

Observations on the Lower Elbe show that *Psylla mali*, Schm. [*R.A.E.*, A, xvi, 56] requires a considerable degree of atmospheric humidity. Infestation is spread over short distances by the adults, but extensive distribution is due to transport of eggs on young trees, etc. Arrangements are being made for the introduction from Canada of the parasitic fungus, *Entomophthora sphaerosperma*.

BÖNING (K.). **Ist die durch die Blattwanze** (*Piesma quadrata*, **Fieb.**) **hervorgerufene Erkrankung der Rübe eine Viruskrankheit?** [Is the Disease of Beet due to the Leaf Bug, *Zosmenus quadratus*, a Virus Disease ?]—*Anz. Schädlingsk.*, iv, no. 1, pp. 8–10. Berlin, 15th January 1928.

Dyckerhoff's experiments on the symptoms produced in beet by the feeding of *Zosmenus* (*Piesma*) *quadratus*, Fieb. [*R.A.E.*, A, xv, 514] are discussed. Further investigation is required to find whether they are due to a virus disease or not.

VAN EMDEN (F.). **Ueber die Bedeutung des Messingkäfers.** [On the Importance of *Niptus hololeucus*.]—*Anz. Schädlingsk.*, iv, no. 1, pp. 6–8. Berlin, 15th January 1928.

The Ptinid beetle, *Niptus* [*hololeucus*, Fald.] has been reported from various parts of Germany of late years [*R.A.E.*, A, xiv, 383], and inaccurate accounts of the total destruction of houses by it have been published. The question whether it breeds in timber is of basic importance in control. The author's examinations of constructional timber have failed to disclose any breeding, but an appeal is made for further data on this subject.

BRAUNE (R.). **Neue Tatsachen zur Biologie des Messingkäfers.** [New Facts concerning the Biology of *Niptus hololeucus*.]—*Mitt. Ges. VorratsSch.*, iv, no. 1, pp. 7–8. Berlin, January 1928.

Fumigation for twenty hours with hydrocyanic acid gas failed to eradicate the Ptinid [*Niptus hololeucus*] in an old building in Germany. Experiments showed that oviposition takes place normally not only in spring, but also in September and October. The beetles wander about during the oviposition period (if not before), and not only after oviposition as hitherto thought. It is supposed that the beetle reproduces repeatedly during the year.

ZACHER (F.). **Weitere Erfahrungen und Beobachtungen über den Messingkäfer.** [Further Experiences and Observations on *Niptus hololeucus*.]—*Mitt. Ges. VorratsSch.*, iv, no. 1, pp. 8–11. Berlin, January 1928.

Though very widespread in Germany, *Niptus hololeucus* is of little importance unless very abundant. It is sometimes injurious to textiles, but does not infest timber. In laboratory observations made with beetles received late in the year, oviposition ceased on 7th December, and most of the beetles were dead by the end of December, only 4·5 per cent. being alive on the 31st. Some individuals received in January oviposited up to the middle of the month. At 16–20° C. [60·8–68° F.] incubation required 11–22 days. Larvae that hatched on 15th October were scarcely half-grown after 80 days. Though the data given in the preceding paper are thus confirmed, it is pointed out that while the maximum damage is done in September and October and especially in November, oviposition is nearly over by that month. Old individuals must therefore be the chief cause of injury.

Die amtliche Bekämpfung des Messingkäfers in der Schweiz. [Official Measures against *Niptus hololeucus* in Switzerland.]—*Mitt. Ges. VorratsSch.*, iv, no. 1, pp. 14–15. Berlin, January 1928.

The Swiss canton of Basel-Stadt has scheduled *Niptus hololeucus*, Fald., as a pest.

KALANDADZE (L.). **Uber die Biologie des Museumskäfers** (*Anthrenus verbasci*, **L.**) **und seine Bekämpfung.** [The Biology and Control of *A. verbasci*.]—*Mitt. Ges. VorratsSch.*, iv, no. 1, pp. 12–13. Berlin, January 1928.

The adults of *Anthrenus verbasci*, L., which is a serious pest in museums, may be observed on flowers in the open from March to June, though they do not cause any injury to them. Mating takes place shortly after emergence in March or April, and oviposition follows in about a week, the eggs being laid singly. At room temperature incubation requires about a month, so that larvae first appear at the end of May or early in June. They pupate in February or March, the adults emerging in 3 or 4 weeks. Naphthalene is a good repellent, and carbon bisulphide or hydrocyanic acid gas are effective fumigants. Where circumstances permit it, the eggs, which cannot resist moisture, may be destroyed by exposure to steam or water.

ZACHER (F.). **Versuche über den Einfluss der Verpackung auf den Schädlingsbefall.** [Experiments on the Influence of Packing on Infestation by Insect Pests.]—*Mitt. Ges. VorratsSch.*, iv, nos. 1 & 2, pp. 2–5, 20. Berlin, January & February 1928.

Experiments with various kinds of chocolate packed in waxed paper, parchment paper, tin foil and aluminium foil showed that larvae of the meal-moth [*Ephestia kühniella*, Zell.] are attracted by nut chocolate and not by milk chocolate or semi-sweet chocolate, which latter foods also cause a high mortality. None of the packing materials repelled the larvae or conferred mechanical protection against them. Better results are obtained by using several wrappings with folds on alternate sides of the package.

KAZANETSKI (N.). **Les ennemis du chrysanthème (pyrèthre) de Dalmatie en rapport avec la dégénération de la plante.**—*C.R. Acad. Agric. Fr.*, xiii, no. 34, pp. 1080–1086, 3 refs. Paris, December 1927.

Studies have been carried out in Dalmatia in 1926–27 to ascertain the cause of a reduction that has recently occurred in the normal duration of the life of pyrethrum plants [*Chrysanthemum cinerariaefolium*] in that country from an average of 7–9 years to 3–4 years, accompanied by a diminution in their insecticidal value. Contrary to a previous statement that in Europe *C. cinerariaefolium* is immune from insect attack, the stems of withered plants examined were found to contain larvae, pupae and adults of the Lamiid, *Phytoecia virgula*, Charp. This is the first recorded instance of *P. virgula*, to which pyrethrum powder is known to be a violent poison, attacking cultivated plants. Pupae of the Melolonthid, *Haplidia transversa*, F., and the Dynastid, *Pentodon punctatus*, Vill., which injure the roots, were also observed. It is concluded that the appearance of *P. virgula* in the stems of *C. cinerariaefolium* is due to the reduction and disappearance of the active insecticidal element in the cultivated plants, which has been brought about by the transplantation of wild plants from their normal conditions of development in arid, stony soil, rich in carbonates, iron, aluminium and manganese, to cultivated, fertile soil through which water filters with difficulty. Plants cultivated on recently cleared forest land absorb large quantities of potash, which contribute to the diminution of their insecticidal qualities. Comparative analyses showed that plants attacked by insects contained no pyrethron, while healthy wild plants contained a greater proportion than healthy cultivated ones. Studies of the effect of pyrethrum powder on *P. virgula* showed that while paralysis began after exposure for 4 minutes to powder from the stems of healthy plants harvested in 1927, the insect was still alive after remaining 3 hours in powder from the stems of plants of the same year that had been infested by it.

Precautionary measures recommended for preserving the qualities of *C. cinerariaefolium* are the exclusive use of seed from wild plants; the choice for cultivation of ground that allows water to filter through it easily, is rich in manganese and carbonates, and contains an amount of potash, phosphorus and nitrogen normal for such a soil; and the observance of great caution in the use of chemical fertilisers, which are liable to hasten the degeneration of the plant.

STRAWINSKI (K.). *Picromerus bidens* (**L.**) (**Hem.-Heteroptera, Pentatomidae**).—*Polsk. Pismo ent.*, vi, pt. 1–2, pp. 123–151, 2 pls., 3 figs., 40 refs. Lemberg, 1927. (With a Summary in German, pp. 148–151.)

Picromerus bidens, L., may in some cases prove beneficial, as it feeds on various noxious insects, including *Lymantria monacha*, L., but does not appear to prefer any particular species. A detailed account is given of its geographical distribution and morphology, and of its development in Poland.

SITOWSKI (L.). **Pimplinae i Braconidae jako pasorzyty przezierników (Sesiidae).** [Pimplinae and Braconidae as parasites of Aegeriids.]—*Polsk. Pismo ent.*, vi, pt. 1–2, pp. 163–166, 1 fig., 7 refs. Lemberg, 1927. (With a Summary in German.)

The author discusses the parasites of *Pennisetia* (*Bembecia*) *hylaeiformis*, Lasp., *Trochilium* (*Aegeria*) *apiforme*, Cl., and *Aegeria* (*Tricholium*) *culiciformis*, L., that he has bred. The hitherto unknown male of *Lissonota nigra*, Br., is described from *P. hylaeiformis*, this parasite having previously only been recorded from *A.* (*T.*) *spheciformis*, Gerning. *T. apiforme* is parasitised by *Meniscus setosus*, Fourcr., while *Ephialtes manifestator*, L., has been reared from larvae of *P. hylaeiformis* and *A. culiciformis*, the latter being also parasitised by the Braconids, *Microbracon* (*Bracon*) *mediator*, Nees, and another species [subsequently identified as *Macrocentrus marginator*, Nees].

NIEZABITOWSKI (E. L.). *Bracon mokrzeckii* **n. sp.**—*Polsk. Pismo ent.*, vi, pt. 1–2, pp. 166–167. Lemberg, 1927.

Microbracon (*Bracon*) *mokrzeckii*, sp. n., is described as an external parasite of the larvae of *Hoplocampa fulvicornis*, Panz., in Poland.

RUSZKOWSKI (J. W.). **Z biologji** " *Bracon mokrzeckii* **Niezabit.**"—*Polsk. Pismo ent.*, vi, pt. 1–2, pp. 167–171, 5 figs. Lemberg, 1927.

Microbracon (*Bracon*) *mokrzeckii*, Niez., has one generation a year in Poland. The eggs are laid on the skin of the larvae of *Hoplocampa fulvicornis*, Panz., the resulting larvae feeding externally on the host larvae. Hibernation occurs in the soil as a mature larva in the cocoon, the adults emerging at the beginning of May.

GRAM (E.), JORGENSEN (C. A.) & ROSTRUP (S.). **Oversigt over Sygdomme hos Landbrugets og Havebrugets Kulturplanter i 1926.** [Report on Plant Diseases and Pests in Denmark in 1926.]—*Tidsskr. Planteavl*, xxxiii, pp. 781–841. Copenhagen, 1927. (With a Summary in English.)

Pests not dealt with in the two preceding reports [*R.A.E.*, A, xiii, 536; xv, 274] include *Polia* (*Mamestra*) *oleracea* attacking the leaves of beet and occurring in unusual numbers on greenhouse tomatos; *Miris dolobratus*, which had not previously been recorded as a pest in Denmark, infesting a seed-field of cocksfoot grass [*Dactylis glomerata*]; and *Phyllobius oblongus*, which destroyed the buds of newly grafted plum.

[Troitzkiĭ (N.).] **Троицкий (Н.).** *Phylloxera* **in Tashkent.** [*In Russian.*]—*Vest. Vinodel. Ukrainui*, xxviii, no. 11, pp. 695–696. Odessa, November 1927.

Phylloxera is recorded for the first time from Turkestan, where egg-laying individuals were found on the roots of vines near Tashkent.

[Shchichenkov (I.).] **Щиченков (И.). Results of a Survey of Crimean Vineyards with Reference to** *Phylloxera.* [*In Russian.*] *Vest. Vinodel. Ukrainui*, xxviii, no. 11, pp. 696–699. Odessa, November 1927.

A survey of the vineyards in the Crimea was carried out in 1927, but no instance of infestation by *Phylloxera* was found. The danger of introducing this pest with imported stock is pointed out, in view of which the regulations governing such importations are to be revised.

[Dekhtyarev (N. S.).] **Дехтярев (Н. С.). The present Situation with regard to the Control of** *Polyphylla fullo*, **L.** [*In Russian.*]—*Vest. Vinodel. Ukrainui*, xxviii, no. 12, pp. 747–751, 1 fig. Odessa, December 1927.

Various methods are discussed of controlling *Polyphylla fullo*, L., a serious pest of vines in the Ukraine, such as collection of larvae and adults, and soil fumigation with paradichlorobenzene (see next paper) or carbon bisulphide, the latter being very expensive, as well as injurious to the vines. Poison baits of bran, dung; etc., were not satisfactory. As the larvae are particularly attracted to dead wood, expecially that of fruit trees, small pieces, about 20 ins. long and ¼ in. thick, were soaked in sodium arsenite and placed in the soil. The poison was dissolved in hot water and the sticks boiled in the solution, 1 lb. sodium arsenite being used to 4 lb. wood. Owing to the difficulty of dissolving sodium arsenite, white arsenic or Paris green would probably be more convenient. The results of experiments with these baits were very promising and warrant further trials.

[Chernyak (V.).] **Черняк (В.). Control of the Larvae of** *Polyphylla fullo*, **L., in the Dnieper Sands, by means of Paradichlorobenzene.** [*In Russian.*]—*Vest. Vinodel. Ukrainui*, xxviii, no. 12, pp. 751–753. Odessa, 1927.

As a result of successful experiments in the Ukraine for the control of *Polyphylla fullo*, L., in vineyards by means of paradichlorobenzene, a special conference was held, the resolutions of which are briefly quoted. This method is particularly recommended where young vines are being planted out, and to ensure the control of this beetle it should be adopted generally.

Report on the Work of the Entomological Department for 1926. [*In Russian.*]—*Odes'ka Kraiova S.-G. Dosvidna Stantz., Ent. Viddil.* [*Odessa Reg. Agric. Expt. Sta., Ent. Dept.*], pt. 2, 67 pp., 2 figs., 15 charts, 1 ref. Odessa, 1927.

The first two papers of this report, by D. V. Znoĭko and A. Kirichenko respectively, deal with the agricultural pests recorded in various districts of the Odessa region during 1925–26. In a paper by D. V. Znoĭko on the oviposition of *Mayetiola* (*Phytophaga*) *destructor*, Say, the susceptibility of various grain crops is discussed. This paper has an English summary. Most of the eggs are laid on soft wheats and rye ; hard wheats and barley are less susceptible, and oats are rarely attacked. On rye, however, only about 0·7 per cent. of the larvae reach maturity. Plants with 1–2 leaves are preferred for oviposition, the attraction of the plant diminishing with increased age. Densely sown crops are somewhat less attacked than those sown sparsely.

In a paper entitled the Ecology of *Polyphylla fullo*, L., under the Conditions occurring in the Sands of Aleshky, L. S. Zimin discusses the type of injury caused by this beetle to vines, and its seasonal history. The effect on the plants depends on their power to throw out additional roots. During the hot, dry summer the larvae go deeper into the soil in search of moisture and attack the deeper parts of the roots. The dryness of the soil above the point of their attack prevents any possible root formation, and the plants wither. Later in the season, when the soil holds more moisture near the surface, the larvae ascend for their final feeding before hibernation, and the proportion of plants killed by their attack decreases. The larvae and pupae occur in the soil at depths of from 10 to 20 inches ; the pupae were found at the beginning of June, and the first adults emerged during the second half of the month. Very little is known about oviposition ; in one case 8 eggs were found at a depth of 30 inches.

Under experimental conditions the larvae were given roots of plum, pear and apricot, but only the last-named was attacked.

Though the adults of *Microphthalma disjuncta*, Wied., were abundant, only very few larvae of *P. fullo* were found to be parasitised; the latter are also attacked by the Asilid, *Satanas gigas*, Eversm.

[KORAB (I. I.).] **Кораб (И. И.). The Pea and the Pea Weevil.** [*In Russian.*]—*Trud. Bilotzerk. Selektz. Sta.* (*Bull. Belaya-Cerkov Plant Breed. Sta.*), ii, pt. 4, pp. 81–126, 7 figs., 27 refs. Belaya-Cerkov, 1927. (With a Summary in English.)

Bruchus pisorum, L., is a serious pest of peas in Russia, and is largely responsible for the great decrease in their cultivation in various areas in the south. A detailed account is given of the various stages of this pest and its biology in general. The appearance of the adults in the field coincides with the flowering of the peas, to which they are attracted from great distances ; they will fly as far as two miles. Though large holes may appear in the flowers as a result of the feeding of these adults, this injury does not normally affect the plants, though they suffered considerably under experimental conditions when the Bruchids were abnormally concentrated. Egg-laying begins early in June, depending on the formation of the pods, the largest number of eggs being laid about the third week in June in the Ukraine. It may continue into July, though the oviposition period for each individual does not extend beyond a fortnight. The eggs are laid on the surface of the young green pods, the average number laid by one individual being 126, with a maximum of 222. Normally, about 3 eggs are laid on each pod, and though under crowded conditions as many as 35 eggs have been laid on a single pod, only one larva reaches maturity in one pea. The larvae hatch in 6–10 days and at once penetrate into the seed. Pupation occurs in the seed ; the adult stage is not reached before the middle of August, and some adults do not emerge till the following spring. It is very improbable that adults emerging in autumn could pass the winter in the field in the Ukraine ; they have not been found in any sheltered places. In store rooms some pass the winter in cracks or between boards, etc., and migrate to the fields in the spring. Those that have not emerged are sown with the seed and emerge in the field.

Observations on the relation between time of sowing and infestation by *B. pisorum* suggest that late sowings should reduce attack ; in practice, however, late maturing plants can only be protected by the use of early trap-crops.

Certain varieties of peas appear to be more resistant to attack than others, but they are of little commercial value. Though various pulses besides *Pisum* spp. were available under experimental conditions, oviposition was only secured on *Lathyrus sativus*. When, however, eggs were placed on the various plants to be tested, it was found that the larvae could develop on them, though they were always refused for oviposition by the adults.

It is recommended that seed lying in the field after harvest should be dug in at once ; if it is allowed to remain long enough for the adults to develop before it is buried, they will emerge from a depth of 8 cm. [3·15 ins.]. Seed containing larvae or pupae did not produce any adults when buried as deep as 8 cm.

The various methods of destroying this pest in stored peas by fumigation with carbon bisulphide, hydrocyanic acid gas or chloropicrin are discussed. The importance of using uninfested seed for sowing and the means of distinguishing it is pointed out [*R.A.E.*, A, x, 222]. Heating the seed or dipping it in hot water will kill the insects. As a result of systematic fumigation of stored peas with carbon bisulphide, infestation in the field in the Ukraine has been reduced from 21·5 to 7 per cent. in two years.

[KALLINIKOVA (T. N.).] **Каллиникова (Т. Н.). Results of quantitative Investigations of the Fauna of Fruit Trees.** [*In Russian.*]—*Trav. Soc. Nat. Leningrad*, lvii, no. 2, pp. 3–34, 5 graphs, 3 refs. Leningrad, 1927. (With a Summary in German.)

A study was undertaken near Leningrad to determine the fauna of three apple trees of different varieties, a plum and a cherry. Mites (particularly *Eriophyes* on apple, and *Tenuipalpus* on cherry and plum) were far more numerous on the leaves than insects, except on one variety of apple. Among the insects on apple, *Psylla mali* predominated. All the mites were found to hibernate in cracks in the tree or under the bud sheaths, with the exception of Tetranychids, which oviposit in autumn and then die.

[VODINSKAYA (K. I.).] **Водинская (К. И.). On the Effect of the Injury to the Root-system of Cabbage by the Larvae of the Cabbage Flies.** [*In Russian.*]—*Morbi Plantarum*, xvi, no. 2, pp. 141–150, 2 figs. Leningrad, 1927.

A detailed account is given of the effect on the resulting crop of injury by *Phorbia* (*Hylemyia*) *brassicae*, Bch., and *P.* (*H.*) *floralis*, Fall., to cabbage at various periods of its growth.

[Shestakov (A.).] **Шестаков (А.). Notes on Injurious Insects in the Yaroslav Government in 1925.** [*In Russian.*]—*Défense des Plantes*, iv, no. 3, pp. 536–538. Leningrad, October 1927.

The condition known as white-ear of rye, which is usually produced by thrips, was found to be also due to *Ochsenheimeria taurella*, Schiff., 30 per cent. of the plants being infested in some fields. *Macrosiphum rosae*, L., was found on the lower surface of strawberry leaves and on the inflorescences of plants flowering for the second time, which were seriously deformed. This injury did not occur at the first flowering and is consequently of no economic importance.

Eggs of *Brevicoryne brassicae*, L., laid on cabbage leaves and kept in boxes during the winter, were placed in the spring in a box containing earth in which *Capsella bursa-pastoris* had been sown. As the larvae hatched, they crawled about the surface, and a few of them were able to reach the plants, which were at a distance of about six inches. These observations indicate that under natural conditions the larvae from such eggs would crawl about in search of wild crucifers, but whether the number of the surviving individuals, particularly after the field has been dug over, would be of any economic importance requires further investigation.

It was found that fallen spruce trees in damp conditions (high grass or undergrowth) may be reinfested by *Ips typographus*, L., thus forming breeding centres.

[Pliginskiĭ (V. Ya.).] **Плигинский (В. Я.). Mites injuring Onions.** [*In Russian.*]—*Défense des Plantes*, iv, no. 3, pp. 538–539. Leningrad, October 1927.

Rhizoglyphus hyacinthi, Boisd., and *Tyroglyphus longior*, Gerv., are recorded as infesting stored onions in Russia.

Clark (A. F.). **The Infestation of *Sirex juvencus* in Canterbury.**—*Te Kura Ngahere*, ii, no. 2, pp. 10–16, 1 pl., 9 refs. Christchurch, N.Z., December 1927.

Conflicting reports have been published in regard to the importance of an infestation in the province of Canterbury, New Zealand, by *Sirex juvencus*, L. (giant horntail) [*cf. R.A.E.*, A, xv, 243], which was said to be a serious danger to plantations of exotic trees, chiefly consisting of various species of pine. As many of these reports appeared to have been exaggerated, an investigation was conducted to arrive at the true position. From specimens collected, it appears that the life-cycle lasts at least two years in New Zealand, where *S. juvencus* seems to have the same habits as in Europe, its country of origin. The method of oviposition is described, the female depositing the eggs in the trunk or branches of the tree, in the woody tissue. The larvae tunnel from two or three to several inches in a downward direction, often towards the pith, and pupate within the tunnel some distance inside the wood, the adults boring their way out after emergence. The habit noted elsewhere of the larvae boring first inwards and then outwards several times, leaving excreta at the bends of the tunnel, which results in injury to the cambium layer and ring-barking by bacterial action, has not been observed in New Zealand. Attack on stacked timber has not yet been recorded, and insects found in logs sold for firewood were probably present when the tree was felled.

In the plantations inspected, dead and suppressed pines of various species were found to be infested by *S. juvencus*, but no healthy trees were attacked. The most marked attacks occurred in plantations where, owing to geological formation, the trees were shallow-rooted. In a plantation where the root system was deep, the attack was negligible. The ability of the tree to obtain an adequate supply of soil moisture undoubtedly increases its power of resistance. Browning of needles, which was frequently observed and at first attributed to *Sirex*, was shown to be due to some other cause, possibly to the presence of the fungus, *Botryodiplodia pinea.* Though this fungus alone is sufficient to cause the death of a tree, it may also render it liable to subsequent attack by *Sirex*.

As *S. juvencus* has been known in the province of Canterbury for several years, its sudden appearance in numbers in 1927 was probably due to climatic conditions. These apparently exist in the north and north-east of the province, to which the main attack seems to be limited, while they are less marked in the south, where infestation is rare. Fairly low temperatures and low relative humidity are likely to prove fatal to the insect. Although the damage caused is at the moment small, actual injury to standing trees being unknown and the distribution of the insect limited, under favourable conditions it is likely to increase and the damage caused will be correspondingly greater.

As regards the control of *S. juvencus* a great deal may be accomplished by careful and systematic thinning ; the weaker trees should be removed from time to time throughout the life of the stand, care being taken to keep the forest floor clear of all dead or fallen matter. Infested trees sawn for firewood must be immediately removed, as they constitute a source of further infestation. An endeavour is being made to introduce into New Zealand the Ichneumonid, *Rhyssa persuasoria*, L., a parasite of *S. juvencus* in Europe, the eggs of which are laid in the burrows of *Sirex* larvae to which the parasite larvae attach themselves on emergence. Similar species occur in New Zealand, including *Megarhyssa fractinervis*, Voll., which is found in the native bush of the west coast [*cf. R.A.E.*, A, xvi, 67]. Birds are also an important factor in the control of *Sirex*, and suitable shrubs should be grown round the plantations to provide them with nesting places.

MUNGOMERY (R. W.). [**Report from the Southern Assistant Entomologist, September-October, 1927.**]—*Qd. Agric. J.*, xxviii, pt. 5, pp. 445–446. Brisbane, November 1927.

A series of cage experiments showed that larvae of *Lepidiota trichosterna*, Lea, and *Pseudoholophylla furfuracea*, Burm., have a decided liking for chopped leaves of *Tagetes glandulifera*. It is therefore probable that when this weed is ploughed under the larvae will feed on it rather than on sugar-cane, which is known to suffer less where the weed has been growing on cultivated lands. Juice extracted from the weed, and chopped leaves, flowers and seeds had no insecticidal properties as regards these cane-grubs.

It is the practice on several plantations to carry out subsoiling operations after the cane has been ploughed out; if this is done during September and October, it destroys the pupae or pre-pupal cells of the larvae and so prevents the emergence of beetles likely to reinfest the same fields.

BATES (G.). **[Report on the Pialba and Nambour Districts.]**—*Qd. Agric. J.*, xxviii, pt. 5, pp. 446–448. Brisbane, November 1927.

Insects attacking sugar-cane in these coastal districts of south-eastern Queensland include: *Phragmatiphila truncata*, Wlk. (moth borer), *Pentodon australis*, Blackb., *Anoplognathus boisduvali*, Boisd., and *Dasygnathus australis dejeani*, Macl. *Pseudococcus boninsis*, Kuw. (*calceolariae*, auct.) and *Perkinsiella saccharicida*, Kirk., occurred in small numbers on cane land in a neighbouring district on the coast.

JARVIS (H.). **Notes on the Breeding of Certain Fruit Flies in Captivity.**—*Qd. Agric. J.*, xxviii, pt. 5, pp. 451–452. Brisbane, November 1927.

In experimental work carried out in Queensland in 1927, apples infested with larvae of *Dacus ferrugineus*, F. (*Chaetodacus tryoni*, Frogg.) in varying stages were placed on 18th January within a large field cage covering a small apple tree in an orchard, carrying a quantity of sound fruit. The first adults emerged on 7th February and were fed on sugar solution. They probably began to oviposit after about a month, as the first infested fruit was observed on 21st March, when the larvae were in the early stages of development.

Dacus (*Chaetodacus*) *jarvisi*, Tryon, is less important than *D. ferrugineus*, as it occurs later in the season, but does considerable damage to pomaceous fruits in February and March. Adults were placed on 19th February in a cage, from the roof of which a ripening apple and pear were suspended. Oviposition took place in the apple on 3rd March, and on 11th March the larvae were partly grown. After the apple had been removed to a breeding jar, puparia were observed beneath it on 21st March, and adults emerged about 12th April. No oviposition was observed on the pear, though the flies visited it and fed on some slight exudation on its surface.

VEITCH (R.). **Report of the Chief Entomologist.**—*Rep. Dept. Agric. Qd.* **1926–27**, pp. 69–73. Brisbane, 1927.

The predacious Histerid, *Plaesius javanus*, Er., liberated against *Cosmopolites sordidus*, Germ. (banana weevil borer) in 1926 [*R.A.E.*, A, xv, 492], was found breeding in the vicinity in which it was liberated. Other banana pests discussed are *Anaphothrips signipennis*, Bagn. (banana thrips) experiments against which have already been noticed [*R.A.E.*, A, xv, 213]; *Dacus* (*Chaetodacus*) *musae*, Tryon, which was controlled on a small scale by the use of stockinette covers on the bunches; the Coreids, *Pendulinus fuscescens*, Dist., and *P. lutescens*, Dist. (banana spotting bug), previously recorded as belonging to the genus *Dasynus* [*R.A.E.*, A, xv, 493]; and the Noctuid, *Tiracola plagiata*, Wlk., a severe outbreak of which occurred in early March, when larvae were observed on the edges of the uncultivated areas adjoining the banana plantations, which they then invaded.

Aphelinus mali, Hald., continues to be of great value in the control of *Eriosoma lanigerum*, Hausm. (woolly apple aphis). *Citrus* was severely damaged by orange-piercing moths, especially by *Othreis fullonica*, L.; the scale-insects attacking this tree were the same as those previously recorded [*R.A.E.*, A, xv, 493].

Other pests studied included *Dacus ferrugineus*, F. (*Chaetodacus tryoni* Frogg.) [see preceding paper], *Nysius* sp. (Rutherglen bug) [*R.A.E.*, A, xv, 353] and *Plutella maculipennis*, Curt. (*cruciferarum*, Zell.).

Davey (H. W.). **Orchard Practice in the Control of Pests.**—*J. Dept. Agric. Vict.*, xxv, pt. 10, pp. 584–587. Melbourne, October 1927.

When *Aphelinus mali*, Hald., has been introduced into an orchard for the control of *Eriosoma lanigerum*, Hausm. (woolly apple aphis), its spread may be accelerated by cutting off at pruning time pieces of wood infested with parasitised Aphids and sticking them into the ground beneath the most heavily infested trees.

An experiment here recorded serves to show that very little is known for certain about the life history of *Cydia pomonella*, L. (codling moth). On 30th December 1926 a band containing codling moth larvae was placed in a glass jar for observation purposes, and moths emerged in January, February and early in March, and again in October, at which time some of the larvae had still not pupated. In all probability if these moths had been caught in the orchard it would have been thought that they belonged to different generations. The long period of time over which these insects emerged makes it apparent that the problem of control is even more difficult than it is generally thought to be. In experiments, baits of cider and water or apple juice and water caught numbers of the moths, but it could not be determined whether they had oviposited or not, while the chief objection to the use of these baits is that beneficial insects are often caught in them. Bands only catch larvae that have completed the damage they do. The most effective means of control is spraying before the larvae have entered the fruit; the spray recommended is 2½ lb. lead arsenate to 80 gals. water, applied first about a week after the petals have fallen and then at intervals of three weeks until about three weeks before harvesting the fruit.

Wenholz (H.). **Storage of Maize in Coastal Districts.**—*Agric. Gaz. N.S.W.*, xxxviii, pts. 3 & 5, pp. 255–261, 367–373, 6 figs. Sydney, March & May 1927.

Losses caused to stored maize by insect pests amount to 10 or 15 per cent. of the crop in those coastal districts of northern New South Wales most suited to its cultivation. The most important is *Calandra oryzae*, L., the life-history of which may be completed in about a month, or may be prolonged for several months under unfavourable conditions. The female weevil lays about 200 eggs; these hatch in 3 days during warm, moist weather, under which conditions the larval stage lasts 3 weeks and the pupal stage 3 or 4 days. The adults fly from sheds and barns at the time when the crop is ripening and lay their eggs on ears of maize having poor or damaged husks, those having well-fitting husks being free from infestation. An early sown crop, maturing when the weevils are numerous, rapidly becomes infested, a second brood appearing by the time the grain is mature in warm weather. The approach of cold weather renders them less numerous and destructive, and late-sown crops that mature in winter are not generally affected. Coastal maize can be successfully stored as shelled grain provided that it contains less than 14 per cent. moisture. As the early crop has to be dried for storage while *C. oryzae* is prevalent, the late crop that matures in winter is the most suitable for this purpose.

Sitotroga cerealella, Oliv. (Angoumois grain moth) also causes considerable injury to maize. As it is active at lower temperatures, it does more damage during the winter than *C. oryzae*, and it appears able to infest any ears, no matter how well covered by the husk. One or several eggs are laid usually at the base of the grain on the ears while they are still immature in the field, the larva hatching in a few days and making its way to the grain near the tip. It eats its way straight through the grain to the opposite side near the crown, where it spins a cocoon and pupates, the larval stage lasting about 3 weeks and the pupal stage a few days, though each may be considerably prolonged. As many as three larvae are often found in a single maize grain. Although infestation spreads rapidly in maize attacked by *S. cerealella* when stored in the ear, shelled grain may be safely stored in bulk or in tightly rammed bags, the moths being unable to emerge where the grain is tightly pressed together. As it appears that all stages resist fumigation to some extent at low temperatures, possibly owing to the fact that carbon bisulphide gas does not readily diffuse in cold weather, it is advisable to choose a warm day for fumigation with this substance when treatment is found necessary during the winter.

Control of *C. oryzae* in stored maize by means of the exclusion of oxygen and the production of carbonic acid gas can be secured in completely airtight tanks either by entirely filling and sealing the tank, or by placing a lighted candle in it when almost full and then sealing it. For fumigation with carbon bisulphide [*R.A.E.*, A, xiii, 558] about ¼ lb. is sufficient to treat a tank of 1,000 gals. containing about 128 bushels of shelled maize; the tank should be closed and sealed immediately, a second fumigation being essential in cases where the gas can escape, even though slowly. Where excessive moisture is present in the seed, its germinating power will be injured by long exposure to the gas, and under such conditions the maize should be aerated after 24 hours' fumigation and subjected to further treatment in 2 or 3 weeks' time. Types of tanks and silos suitable for storage are described.

To minimise infestation of the early maize crop in the field, sheds and barns should be thoroughly cleaned early in spring, while clean harvesting and deep ploughing soon afterwards greatly diminish the survival over winter of weevils in the field itself.

Gardner (J. C. M.). **Identification of immature Stages of Indian Cerambycidae. II.** — *Ind. Forest Records*, xiii, pt. 2, pp. [31]–[61], 4 pls., 5 refs. Calcutta, 1927.

This is a continuation of a series of papers dealing with the various groups of Cerambycids occurring in India [*R.A.E.*, A, xiv, 138], the majority of the larvae described being of great importance as pests of various forest trees. Keys to the larvae are given for the subfamilies of the CERAMBYCIDAE ; and the Indian species of the CERAMBYCINAE, PRIONINAE and LAMIINAE. Descriptions or references to descriptions of the various larvae (and in a few cases eggs and pupae) are also given, with notes on the food-plants.

LEEFMANS (S.). **Een nieuwe plaag aan hoemapadi** (*Latoia bicolor* **Wlk.).** [A new Pest of Rice grown in dry Fields.]—*Landbouw,* iii, no. 6, pp. 387–389, 1 fig. Buitenzorg, 1927.

The Limacodid, *Parasa* (*Latoia*) *bicolor*, Wlk., is recorded as a pest of rice grown in dry fields in Java. Though local, the injury seriously affected the yield. The cocoons were found at the bases of the rice plants or between the basal leaves. After the rice was destroyed, the caterpillars passed to *Saccharum spontaneum.*

TAKAHASHI (S.). **Report of an Outbreak of the Sweet Potato Pest,** *Anophia leucomelas,* **L.** [*In Japanese.*]—*Insect Wld.*, xxxii, no. 1, pp. 16–22. Gifu, January 1928.

The Noctuid, *Anophia leucomelas*, L., occurs in Formosa, the south of Japan and the islands between them, outbreaks of it sometimes causing serious damage to sweet potato. In the south of Kiushu it has three generations a year, the adults emerging in May, July and September. Hibernation occurs in the pupal stage. The larvae feed on the leaves and tend to migrate to a new field from a heavily infested one.

WILLARD (H. F.). **Parasites of the Pink Bollworm in Hawaii.**—*Tech. Bull. U.S. Dept. Agric.*, no. 19, 15 pp., 6 figs., 13 refs. Washington, D.C., November 1927.

Records of the food-plants of *Platyedra* (*Pectinophora*) *gossypiella*, Saund. (pink bollworm) in the Hawaiian Islands, where it is the most destructive pest of cotton, are discussed ; it has been found on *Thespesia populnea, Hibiscadelphus hualalaiensis* and *Hibiscus youngianus, T. populnea* being frequently attacked. Collections on cotton showed the bollworms to be very prevalent ; one lot of 22 bolls contained an average of 5·1 larvae to a boll, while only isolated plants or groups of plants were entirely free from infestation.

Seven species of parasites attack *P. gossypiella* in Hawaii, all of which, except *Stomatoceras pertorvus*, Gir., have been reared by the author, and are as follows, the average percentage of parasitism being shown by the number in brackets after the name ; the Braconids, *Chelonus blackburni*, Cam. (5·45) and *Microbracon mellitor*, Say (2·33), the Ichneumonids, *Pimpla hawaiiensis*, Cam. (0·03) and *Pristomerus hawaiiensis*, Ashm. (0·38), the Bethylid, *Perisierola emigrata*, Rohw. (0·17), and the Chalcid, *Brachymeria* (*Chalcis*) *obscurata*, Wlk. (0·06). This low percentage of parasitism, only 8·42 in all, can probably be accounted for by the fact that none of these six insects is a specific parasite of *P. gossypiella*. Though parasitism by *C. blackburni* was the highest, reasons are given for considering that it was influenced by special factors, and *M. mellitor* is thought to be the most valuable under Hawaiian conditions, being capable of attacking its host throughout the major part of the year, while it is also distributed over a larger area. Adults survived for considerable periods (up to 18 days) without food and for 24–102 days when fed on honey and water. Mating occurs at any time during the adult stage. Oviposition may begin within 2 days of emergence, but often does not do so for 5 to 7 days. One unmated female deposited 79 eggs from which 28 adults were reared, all of which were males ; the sexes are about equal in numbers in the offspring of fertilised females. One individual deposited 213 eggs in captivity, oviposition taking place almost daily throughout its lifetime. The eggs are deposited directly on the host larva or on the cotton lint surrounding it, the larva having first been stung and paralysed. The stages of *M. mellitor* are fully described ; the maximum egg, larval, prepupal and pupal stages occupied 28, 187, 28 and 132 hours, respectively, or a total of about 16 days. The larva feeds externally on the host, and will destroy others of its own species, though one large host may sometimes support two parasites.

Mating of *Perisierola emigrata*, Rohw., has only been observed as taking place within the cocoon of the female, which is capable of depositing over 200 eggs. Oviposition does not take place until the larva has become paralysed, which occurs about 5 minutes after it has been stung. As many as 29 eggs may be deposited on a single larva, the average being about 15. Parthenogenetic reproduction may occur, the offspring being all males. Females fed on honey and water may survive for over 7 weeks.

SILVELA (F.). **Sobre la pretendida infección del tomate de Canarias por la** *Ceratitis capitata.* [The alleged Infestation of Canary Tomatos by *C. capitata.*]—*Bol. Agric. téc. econ.*, xix, no. 226, pp. 460–463. Madrid, November–December 1927.

In view of the fact that *Ceratitis capitata*, Wied., has been recorded in tomatos in Hawaii, an examination of very large numbers of tomatos was made in November 1927 in the Canary Islands by an inspector of the U.S. Department of Agriculture and by the author. In one solitary instance a Dipterous larva was found that may perhaps prove to be *C. capitata*, which is common on oranges in the islands. As tomatos are shipped green and are subject to strict inspection, the maximum guarantee of safety is afforded.

MACDONALD (R.). **Report of Cotton Crop in Swaziland up to February 1928.**—*Swaziland : Resid. Commr. Despatch* no. 93, 6th March 1928, 2 pp. typescript. [Recd. from Colonial Office 18th April 1928.]

The Jassid [*Empoasca facialis*, Jac.] and the red bollworm [*Diparopsis castanea*, Hmps.] have been the insects mainly responsible for damage to the cotton crop in Swaziland in recent years. At the time of writing *D. castanea* had not caused much anxiety during the season 1927–1928. A slight infestation of *E. facialis* was present in all areas, and its development would be detrimental to the prospects of the crop. The scattered areas sown with special Jassid-resistant seed issued free to growers has not shown any effect of this attack.

CURRAN (C. H.). **Studies in African Tachinidae (Diptera). III.**—*Bull. Ent. Res.*, xviii, pt. 3, pp. 237–245. London, February 1928.

Among the species described is *Actia nana*, sp. n., from *Earias* sp. in Uganda. Keys are given to the species of *Sericophoromyia* and *Dejeania*.

MILES (H. W.). **Investigations on the Control of the Khapra Beetle** (*Trogoderma granarium*, **Everts) with Calcium Cyanide.**—*Bull. Ent. Res.*, xviii, pt. 3, pp. 251–255, 2 figs., 1 table, 7 refs. London, February 1928.

Trogoderma granarium, Everts, was probably introduced into Britain in Indian barley during the War, and though it subsequently proved of little importance in stored barley, it bred readily in the higher temperatures of malt bins, a considerable number of which are infested at the present time. Owing to the lack of further supplies of chlorpicrin, which after the War was easily available and which proved of great value, little control treatment has been carried on in the past 3 or 4 years, so that the beetle has been increasing. Thorough cleaning of the bins in the summer when the last malt is drawn off does not eradicate it, as the immature larvae are not removed from the deeper crevices.

Laboratory experiments with cyanogas calcium cyanide "G" [*R.A.E.*, A, xiv, 444] were made against the larvae at a temperature range of 67–72° F. and a relative humidity of 76–85 per cent., the exposures varying from 19½–24 hours. The initial dosage, 10 oz. to 1,000 cu. ft., gave 13·8 per cent. kill. When the dosage was increased to 15 oz., all larvae were inactive the next day, but numbers gradually revived. With the humidity increased to 85 per cent., however, 12½ oz. to 1,000 cu. ft. gave 88–92 per cent. kill after 19–24 hours' exposure. Explanations of the state of inactivity and apparent lifelessness of the larvae after fumigation are offered.

Based on these experiments, other fumigations were made in commercial malt bins, with successive dosages of 1, 1¼ and 2 lb. per 1,000 cu. ft. as the temperature and relative humidity of the bins decreased. The temperatures varied from 69–58° F. and the relative humidity from 69–61 per cent. With the 1 lb. dosage these conditions were at their best and the majority of larvae were in superficial positions or shallow crevices, and a 95 per cent. kill was obtained after 6 days' exposure. With the dosage increased to 1¼ lb. and an exposure of 7 days there was a mortality of 68·8 per cent.; larvae at the surface, which were difficult to find, were all dead. The third fumigation, at a dosage of 2 lb. and the same exposure, gave 48 per cent. mortality, practically all larvae being found in deep crevices, some over 10 ins. below the surface. The gradual decrease in the numbers of larvae in surface crevices, which influenced the results of the second and third fumigations, was due to many being killed by the hydrocyanic acid gas and the penetration of the remainder into deep crevices in the wall.

The most successful results will probably be secured when several fumigations are carried out in summer as soon as possible after the malt has been drawn off. The bin should be made as air-tight as possible, and the calcium cyanide scattered evenly over the floors, the bins being finally closed and left for about a week before ventilating. It is considered that calcium cyanide will give a satisfactory control of both adults and immature stages of this beetle.

MARSHALL (G. A. K.). **New injurious Curculionidae (Col.).**—*Bull. Ent. Res.*, xviii, pt. 3, pp. 257–266, 5 figs. London, February 1928.

Blosyrus aequalis, Har., originally described from Angola, and *B. haroldi*, Hartm., have been bred from sweet potatoes in Belgian Congo, and *Isaniris pusillus*, Hustache, from leaves of coffee in Uganda. The following new weevils are described: *Protostrophus perspicax* defoliating citrus trees, and *Orthomias edax* damaging cotton plants, both from S. Africa; *Systates perblandus* injurious to maize and *S. smeei* attacking the leaves of tea in Nyasaland, both also occurring in Portuguese East Africa; *Nanophyes terminaliae* bred from fruits of a timber tree, *Terminalia paniculata*, in Madras, and at times so abundant as to make it difficult to obtain sufficient seed for planting purposes; *Conotrachelus phaseoli*, the larvae of which bore in stems of haricot beans (*Phaseolus vulgaris*) in Brazil; and *Athesapeuta cyperi*, the larvae of which bore in the stems of nut grass (*Cyperus rotundus*) and which has been introduced into Honolulu from the Philippines for the purpose of destroying this plant.

Tanyremnus, gen. n., is erected for *Tanyrrhynchus loripes*, Boh., attacking *Pinus pinaster* in Cape Province. *Gonipterus platensis*, Marelli, is now considered a distinct species [*R.A.E.*, A, xv, 237], though it may have already been described from Australia.

BARNES (H. F.). **Wheat Blossom Midges (Cecidomyidae, Diptera). Differences between *Contarinia tritici* (Kirby) and *Sitodiplosis mosellana* (Géhin).**—*Bull. Ent. Res.*, xviii, pt. 3, pp. 285–288, 3 figs., 2 refs. London, February 1928.

Dr. Felt in 1912 came to the conclusion that no species of midge attacking wheat ears in America could be referred to *Contarinia tritici*, Kby., although this species had often been recorded as responsible for the great losses suffered by wheat growers in that continent. The damage is in fact caused by *Sitodiplosis mosellana*, Géh. The same mistake is constantly made in Britain. In the egg, larval and adult stages, *S. mosellana* is orange to carrot-red, while *C. tritici* is golden yellow in colour. In the field, the larvae of the former midge are found actually on the kernel itself, while those of the latter are to be found in the brush among the anthers and pollen at the top of the kernel. Morphological characters are given to distinguish the two species, as well as notes on the making of water slides when the midges sent for identification have lost their colour. Males will probably never be seen unless they are reared. Descriptions are given of the adult females of both midges.

OGILVIE (L.). **Methods employed in breeding *Opius humilis*, Silv., a Parasite of the Mediterranean Fruit-fly (*Ceratitis capitata*, Wied.).**—*Bull. Ent. Res.*, xviii, pt. 3, pp. 289–290, 1 pl. London, February 1928.

Ceratitis capitata, Wied., first reached Bermuda in 1865, and since then, has become a pest of first importance on all kinds of thin-skinned fruits. Peaches, which formerly grew in great abundance in the island, were rendered unproductive, and the fruits of loquat, sapodilla, Surinam cherry (*Eugenia uniflora*), peppers [*Capsicum*] and, to a less extent, *Citrus*, papaya, sugar-apple [*Anona squamosa*] and guava were severely infested. In 1907 a campaign was carried on for 4 years against this fly, but no permanent benefit was secured, probably owing to the fact that it was breeding on broad beans and to a less extent on bananas [*cf.* *R.A.E.*, A, xiv, 624]. The widespread occurrence of thickets of the Surinam cherry also impeded the work. Consignments of parasitised puparia of *C. capitata* were received from Hawaii in 1926 and 1927, and numbers of *Opius humilis*, Silv., were bred, 146 individuals being released in 1926 [A, xvi, 17]. It had been previously decided to release only this parasite and none of the others liberated in Hawaii in 1913, as it is the most effective and the others act in unfavourable competition with it. Hence other parasites, such as *Tetrastichus giffardianus*, Silv., were destroyed.

The method of breeding *O. humilis* is described. When the parasites emerge, they are transferred to a cylindrical glass lamp-chimney 9 ins. in length and 1¾ ins. in diameter, the end of which has been covered with a piece of fine lawn secured by an elastic band. The pronounced negative geotropism of the insects just after emergence makes this simple. Into the cylinder is then inserted a trough made of folded cardboard containing suitable infested fruits, and the uncovered end is closed in the same way as the other end. The parasites are fed by rubbing on to one of the pieces of lawn honey and water mixture (4 or 5 drops of honey to a watchglass about ¾ full of water). A second piece of lawn is fastened over the moistened piece to prevent evaporation and to keep off ants, etc. The cylinders are then placed at an angle of about 45° in a suitable-sized box facing the light in a cool position. Mating takes place readily under these conditions, and there is abundant oviposition by the females. They should be fed morning and evening. In very hot weather water may be placed on the covering during the heat of the day. If about 6 females are present, some three-quarters of the larvae in a cylinder will become parasitised in the course of a day. The fruits should then be removed and placed on clean sand in glass jars, the mouths of which should be covered with cheesecloth. The parasites are transferred to clean tubes and fresh trays of fruit are introduced. The parasites emerge from the fruit-fly puparia about a fortnight after pupation, or 3 or 4 days after the majority of the unparasitised fruit-flies.

DAVIES (W. M.). **On the Economic Status and Bionomics of** *Sminthurus viridis*, **Lubb. (Collembola).**—*Bull. Ent. Res.*, xviii, pt. 3, pp. 291–296, 1 pl., 2 figs., 8 refs. London, February 1928.

Sminthurus viridis, L., is the only British species now included in this genus. It is found commonly, especially in spring and autumn, on grassland and clover all over the British Isles, and has been recorded from Australia, New Zealand and the whole Palaearctic Region. It is phytophagous, though many related species are saprophytic. Experiments are described showing that the damage caused by it to clover is considerable. It feeds during both day and night, and has also been observed to attack root crops, cereals and grasses, so that it is able to exist on other crops in rotation and be present when a field is laid down to clover or grass. Experiments were also made to test its selective feeding habits, and it was found to feed on wild white clover (*Trifolium repens*), late-flowering clover (*T. pratense*), rye grasses (*Lolium* spp.), cocksfoot (*Dactylis glomerata*) and timothy (*Phleum pratense*) more or less indiscriminately; this is surprising in view of the fact that ample evidence was obtained in the field by sweeping that there was a greater preponderance of this species on patches of clover over those areas where little clover existed. It is possible that confinement in cages prevented the selective habit from being established.

Sweeping of infested areas with tarred sacks, as used against *Bourletiella hortensis*, Fitch, on mangels [*R.A.E.*, A, xiv, 620] would reduce the numbers considerably, but the presence of the nurse crop prevents this being done at the critical stage in the life of the young seedling clover or grass. Heavy rolling and chain harrowing are recommended, and by arranging tarred sacks in front of the roller, the former should be doubly effective. A dust containing 5 per cent. nicotine sulphate [*R.A.E.*, A, xiii, 424] has afforded control in greenhouse attacks or heavy local infestations. No insect parasites have yet been bred from Collembola, and the only predator as yet known is an unidentified spider.

In the laboratory *S. viridis* was observed to oviposit each month from March to November 1926, observations having been suspended for the remaining months. The method of oviposition is described. Eggs are laid in batches varying from 2 or 3 to 30 or 40 according to whether the female is disturbed or not. They are usually laid on damp decaying leaves and other moist surfaces at the base of the plants; occasionally they are found singly on the underside of the lower clover leaves. Hatching took place 20–25 days after oviposition at an average temperature of 15° C. [59° F.], and maturity is reached in about 8–10 weeks. No pairing was observed, nor has any ever been recorded among Collembola, and no indication of moulting was seen.

MASSEE (A. M.). **The Life-history of the Black Currant Gall-Mite, *Eriophyes ribis* (Westw.), Nal.**—*Bull. Ent. Res.*, xviii, pt. 3, pp. 297–309, 2 pls., 1 fig., 25 refs. London, February 1928.

Eriophyes ribis, Westw., is one of the most important pests of soft fruits in Britain. An extensive summary is given of the observations of previous workers on the bionomics of this mite arranged so as to be comparable with those of the author. During his investigations, which have been carried out for several years at East Malling, Kent, it was observed that the immature and adult mites enter newly formed buds towards the end of May, or considerably later (June–July) in some seasons, only 2 or 3 usually entering one bud. They pierce their way to the centre and commence to breed, eggs being found within 3 or 4 days of the entry of the mites. They appear to breed very rapidly at this season. In an average season swollen buds are seen by the third week in August, and on many bushes the number of big-buds continues to increase until March. It is not always possible to determine which buds are inhabitated before the latter part of July, and even then they can only be determined with certainty by dissecting buds and examining them individually under a microscope. Eggs are present all the year round; they may be deposited on the shoots, blossoms or leaves. It is estimated that upwards of 100 are laid by one individual. The egg stage lasts 3–7 days during the spring and summer, but during the winter occupies 3 or 4 weeks. Up to the present eggs have not been found in the soil.

Spring migration depends on the weather conditions, the earliest record being 1st April (1923); as a general rule it reaches its height at the end of April or in May. The period of migration does not vary on early and late varieties of currants. A detailed study made from June to October over six years did not reveal a second migration period, and during this time the mites were living and reproducing within the buds. Directly the mites begin to vacate the semi-drying big-buds in the spring they collect into large colonies, which remain for some time, sheltering beneath the outer bud scales, until the conditions (presumably mainly temperature) are favourable, when they disperse in all directions. They feed on the tender leaves, more frequently on the lower surface, immediately they migrate, and subsequently oviposit on the leaves and flowers. They then crawl to the new growth, and remain there until the new buds are sufficiently large for them to enter. During the migration periods of 1925 and 1926, the Coccinellids, *Adalia bipunctata*, L., and *Coccinella septempunctata*, L., were found frequently with numerous mites attached to the lower surface and legs. In some years the Aphid, *Amphorophora cosmopolitana*, Mason, is one of the chief distributing agents, and bees occasionally carry mites from one bush to another, and probably for longer distances. No evidence was obtained to support the theory that wind accounts for the spread of the mites. The leaping habits of the mites are described. They respond readily to change of temperature as regards migration, especially under artificial conditions, but cold weather did not appear to affect their activity within the buds to any marked extent. Experiments proved that they do not pass any period of their life-cycle in the soil.

In November 1924 500 big-buds were examined, and 25 per cent. of them contained larvae of the Chalcid parasite, *Tetrastichus eriophyes*, Taylor. The larvae of *Chrysopa vulgaris*, Schn., and of an undetermined Syrphid were found feeding on the mites during the migration period. They are also infested by the fungus, *Botrytis eriophyes*, but this is not common in the big-buds until the end of May or in June, and at this season the majority of the mites have migrated from them. Black currant is the chief food-plant, others being red and white currant, gooseberry and the American flowering currant. Hazel is not infested by this mite but by *Eriophyes avellanae*, Nal., and the characters distinguishing it are given.

MYERS (J. G.). **A Note on Australian Typhlocybine Leafhoppers, with a Description of a new Species.**—*Bull. Ent. Res.*, xviii, pt. 3, pp. 311–312, 1 fig. London, February 1928.

A list is given of the 14 Australian TYPHLOCYBINAE already known, and a further species, *Erythroneura ix*, sp. n., is described from Victoria. This species is stated to be becoming abundant as a garden pest near Melbourne, where it attacks almost all kinds of garden plants, vegetables and weeds.

DEKHTIAREV (N. S.). *Sciaphobus squalidus*, **Gyll. (Col., Curcul.), a Pest of Orchards in Ukraine.**—*Bull. Ent. Res.*, xviii, pt. 3, pp. 313–317, 1 pl., 1 fig. London, February 1928.

Sciaphobus squalidus, Gyll., is a serious pest of all kinds of fruit trees in the Ukraine, and has also been recorded in the northern

Caucasus, Crimea, Bessarabia and Hungary. Notes are given on its bionomics, a fuller account of which has already been noticed [*R.A.E.*, A, ii, 337].

The adult weevils, which are wingless, have been recorded on a great number of different plants; among herbaceous plants they especially prefer nettles (*Urtica*), wormwood (*Artemisia*) and *Poa* spp. and other Graminaceae. Early in spring they eat out the buds of fruit trees, pear trees suffering especially. The lowest branches are particularly damaged. Gooseberry and currant bushes attract enormous numbers.

The most suitable remedial measures would be those that could be utilised against the other Curculionids that attack fruit trees, such as various species of *Rhynchites* (*R. auratus*, Scop., living chiefly on cherry trees and *R. giganteus*, Kryn., on pear trees), *Byctiscus betulae*, L., *Anthonomus pomorum*, L., *Phyllobius* and *Polydrosus*. These weevils, however, can all fly, and are more closely associated with fruit trees than *S. squalidus*. Various measures have already been noticed [*R.A.E.*, A, ii, 339]. Placing rags soaked in petroleum or tar on the ground in a ring round the base of the tree has proved effective, as has a proprietary adhesive banding material, which, however, cannot be used on bushes. If a suitable sticky spray could be devised, it might be effective where insecticides do not give the necessary results; one containing molasses disabled all the weevils on a tree for a short time.

Experiments on fruit trees with a lime spray with the addition of arsenicals gave poor results, even at a concentration of 1 lb. sodium arsenite, 10 lb. lead arsenate powder, 50 lb. hydrated lime and 100 gals. water containing flour as a spreader. The beetles feed on the buds and therefore consume but little poison. Excellent results, however, were obtained by spraying gooseberries bearing their first young leaves, when the fruit trees were still quite bare, with 3 lb. lead arsenate powder, 100 gals. water, and 3 qts. milk to which 10 oz. hydrated lime had been added earlier. A lead arsenate spray without milk and lime was not so efficient. Dusts are also useless until the buds are open, but can then be applied with the same success as the spray. Various dusts were tried against the weevils on gooseberries in leaf, and two applications at intervals of 3–5 days of calcium arsenate and lime, or lead arsenate and sulphur (15 : 85) proved of considerable value.

GOLDING (F. D.). **Notes on the Bionomics of Cotton Stainers (*Dysdercus*) in Nigeria.**—*Bull. Ent. Res.*, xviii, pt. 3, pp. 319–334, 7 refs. London, February 1928.

One of the objects of this paper is to collate the data on the bionomics of the species of *Dysdercus*, accumulated during the years 1922–27. Much of the information has been noticed [*R.A.E.*, A, xii, 67; xiv, 321] and is substantiated by subsequent observations. The species that have been recorded from Nigeria are *D. superstitiosus*, F., *D. melanoderes*, Karsch, *D. fasciatus*, Sign., and *D. haemorrhoidalis*, Sign., as well as three others the identification of which is doubtful. Of these the species recorded as *D. nigrofasciatus*, Stål [iii, 165] was probably *D. haemorrhoidalis* or the banded form of *D. superstitiosus*. From the rather scanty data available it is concluded that both forms of *D.*

superstitiosus are widely distributed in Nigeria, *D. melanoderes* is most numerous in the humid forest zone, and *D. fasciatus* in the savannah country.

The banded form of *D. superstitiosus* is more numerous than the spotted form on standing cotton and all alternative food-plants (except Graminaceae) from May to September. In October there is a sudden influx of spotted migrants to cotton and maize, and in November many adults of this form appear on guinea corn (*Sorghum*), *Hibiscus esculentus* and *H. sabdariffa*, while the banded form is seldom seen on maize or guinea corn. The colouration of the spotted form varies from shades of yellow through orange to red ; adults of all colours were observed to pair indiscriminately in the field. It seems probable that the colour variations of this form are of seasonal rather than dietetic origin.

The migration of the spotted form from cotton in the Ibadan district occurs in January-March, and is apparently induced by the flowering of *Bombax* and *Sterculia*. It is possible that atmospheric conditions are to some extent responsible for the migration from cotton in January, as humidity is greater in the thick bush containing *Bombax* than in the cotton fields at Ibadan. There is a slight indication that there is a tendency to migrate in a southerly direction, presumably as a result of the arid harmattan wind from the Sahara. After October stainers are practically absent from cotton in the Northern Provinces, where the harmattan is very severe.

The banded form of *D. superstitiosus* remains on the cotton longer than the spotted form, and there is no evidence of any migration of this form occurring prior to the uprooting of the cotton crop at the end of March. There is a definite rhythm in the weekly proportions of the sexes during the cotton season; males predominate among the early migrants to cotton and among the first individuals to mature of each generation.

The maximum migration of *D. melanoderes* synchronises with that of the spotted form of *D. superstitiosus*. The variation in its numbers on cotton at Ibadan appears to be determined by the duration of the rainless periods in July-September ; it is rare after a prolonged period of little or no precipitation. Even during the wet season it is not numerous, probably owing to its preference for the forest zone.

D. fasciatus is rare at Ibadan, preferring the more arid savannah country, where it is a cotton pest of some importance. At Ilorin it is common on fallen fruits of the baobab (*Adansonia digitata*), although it is rarely found on cotton [*cf. R.A.E.*, A, xvi, 156].

D. haemorrhoidalis is rare on cotton though fairly common on *Bombax* in February and March, and occurs most frequently in the humid forest zone.

The most striking features of observations that have been made on the pairing of distinct species of *Dysdercus* are the comparatively high percentage of females of *D. melanoderes* pairing with males of the spotted *D. superstitiosus*, and the fact that banded males of *D. superstitiosus* did not pair with females of either the spotted form or *D. melanoderes*. A table is given showing the average duration of the various instars of the spotted and banded forms of *D. superstitiosus*, and of *D. melanoderes* and *D. fasciatus*; the total periods from egg to adult are, respectively, 34–40, 29–35, 36–42 and 31–37 days.

The principal alternative food-plants of *Dysdercus* are *Hibiscus* spp., *Bombax* sp., *Sterculia* sp., *Urena lobata* and *Abutilon zanzibaricum*. They may also feed on *Sida carpinifolia*, *Triumfetta rhomboidea* ; the fruits of *Elaeis guineënsis* and mango ; maize cobs ; and the seeds of guinea corn and grasses, etc. The incidence of the various species on these plants is summarised in a table.

ZWEIGELT (F.). **Der Maikäfer. Studien zur Biologie und zum Vorkommen im südlichen Mitteleuropa.** [The Cockchafer. Studies on its Biology and Occurrence in southern Central Europe.]—*Monogr. angew. Ent.*, no. 9 (*Beih. Z. angew. Ent.*, xiii), xii+453 pp., 19 maps, 230 refs. Berlin, P. Parey, 1928. Price *M*.28.

This monograph embodies the results of fifteen years' investigations on *Melolontha melolontha* and *M. hippocastani* in southern Central Europe, with pre-war Austria as the centre. Observed facts have been used for deducing the conditions governing spread, development, and infestations. The work done will also provide a basis for investigations in other infested regions, such as Germany. The author considers that these observations have finally settled the question of the rate of development of *Melolontha*, showing that this is not fixed racially but varies in accordance with external factors.

The first section of the book, comprising 349 pages, contains the detailed data obtained in the various districts in which observations were made, these being then collated in a general section of about 100 pages.

The problems discussed are dealt with under a variety of headings, including distribution, effect of climate, proportion of the sexes, variations in flight-years, and the presence of areas where infestation of a severe character no longer occurs.

Observations of the plants attacked by the beetles showed that oak, *Aesculus* and cherry suffered most, followed by beech and willow, while maple, larch, apple and alder were less seriously damaged. As compared with about 600 reports of injury to fruit trees, 70 for conifers and about 850 for deciduous trees were received, of which latter nearly one-third referred to oak. Infestation by the larvae centred on potatoes, records of damage to potato exceeding those of all other crops. Wheat, maize, and garden and meadow plants followed. Crows, starlings and moles are valuable natural enemies. Collection of the beetles is still the best artificial measure.

AHLBERG (O.). **Rönnbärsmalen** *Argyresthia conjugella* **Zell. en redogörelse för undersökningarna åren 1921-1926.** [*A. conjugella*, a Report on Investigations in 1921–1926.]—*Medd. CentAnst. Försöksv. Jordbr.*, no. 324 (Lantbruksentom. avd. no. 52), 127 pp., 57 figs., 99 refs. Stockholm, 1927. (With a Summary in English.)

The apple fruit miner, *Argyresthia conjugella*, Zell., is the most destructive pest of apples in Sweden. Its natural food-plant is mountain ash (*Sorbus aucuparia*), on the green fruits of which the eggs are laid in early summer. After 12–13 days, the larvae hatch and soon enter the fruits, in which they remain till the autumn, when they let themselves down to the ground, where they hibernate as larvae or pupae, the adults emerging early in the following summer. Whenever the fruits of *S. aucuparia* fail, the larvae are to be found in cultivated apples or in fruits of the beam-tree [*S. aria*]. Statements that they occasionally occur in other fruits are based on misidentification. In Sweden the moths are on the wing for about seven weeks, beginning at Stockholm early in June. In out-door cages oviposition began about 17 days after the first moths emerged and lasted about 40 days. Each female appears to lay only 9–10 eggs. At a mean temperature of 13° C. [55·4° F.] incubation takes 12–13 days.

Serious outbreaks have occurred on apple in Sweden in at least seven seasons in the present century, and sometimes more than half the crop has been destroyed. Apples are usually attacked only when the fruits of mountain ash fail, though sometimes the moths are driven by wind from trees in exposed positions to the more sheltered orchards. Different varieties of apple are attacked in varying degrees.

The fluctuations in the numbers of *A. conjugella* are largely due to the activity of parasites, particularly *Microgaster politus*, Marsh., which attacks the larvae. Parasites of minor importance are *Epiurus calobatus*, Grav., *Angitia exareolata*, Ratz., *A. crataegellae*, Thoms., and perhaps also *Tetrastichus pospelovi*, Kurdj., *T. roesellae*, Nees, and *T. tibialis*, Kurdj.

In experiments a spray containing 1 per mille nicotine gave good results in destroying the eggs. It should be applied 30 days after the moths first appear and again 12 days later. About 88 per cent. of the eggs are killed. It may be possible to use mountain ash, crab-apples, etc., as traps in orchards, the infested fruits being picked and destroyed.

STRAWINSKI (K.). **Import much do Ameryki.** [Importation of Flies into America.]—*Las Polski*, 1927, reprint, 11 pp., 5 figs. Warsaw, 1927. (With a Summary in English.)

This is a popular account of the organisation of stations in Poland for breeding parasites of *Panolis flammea*, Schiff., and *Porthetria* (*Lymantria*) *dispar*, L., for export to the United States.

SITOWSKI (L.). **O pasorzytach barczatki** (*Dendrolimus pini* **L.**) **i mniszki** (*Lymantria monacha* **L.**). [Parasites of *D. pini*, L., and *L. monacha*, L.]—*Rocz. Nauk. rol. lesn.*, xix, reprint, 12 pp., 11 refs. Poznań, 1928. (With a Summary in German.)

Lymantria monacha, L. and *Dendrolimus pini*, L., have been causing considerable damage in Poland in forests along the banks of the Vistula. The chief parasite of the latter is the Anthomyiid, *Muscina pabulorum*, Fall., which attacked about 60 per cent. of the larvae, being particularly abundant where sticky bands had been applied. The latter form concentrated breeding places for this parasite. Next in importance are *M. stabulans*, Fall., and *Stomoxys calcitrans*, L., the latter being recorded for the first time as a parasite of this host. *Aphiochaeta rufipes*, Mg., usually only attacks unhealthy larvae of *D. pini*; it normally breeds in decaying vegetable matter, and has also been observed as a pest of germinating pine seeds, of which 50 per cent. were injured. *Sarcophaga* (*Agria*) *affinis*, Fall., is an important parasite of both *D. pini* and *L. monacha*, parasitism amounting to 10–15 per cent. and 30–40 per cent. in these hosts respectively. It is also a parasite of *Stilpnotia salicis*, L., and *Porthetria* (*L.*) *dispar*, L. *Tachina larvarum*, L., only occurs sporadically. About 7 per cent. of the larvae of *L. monacha* were parasitised by *Parasetigena sylvestris*, R.D. (*segregata*, Rond.), which is mainly a parasite of *Porthetria dispar*. *Eriothrix rufomaculatus*, DeG., is recorded for the first time as a parasite of *D. pini*. Ichneumonids were less abundant; those attacking *L.*

monacha were *Pimpla examinator*, F., and *P. capulifera*, Kriech., and those attacking *D. pini* were *Exochilum giganteum*, Grav. (33 per cent.), *P. inquisitor*, Scop., *P. instigator*, F., *P. holmgreni*, Schmdk., *Theronia atalantae*, Poda, *Pristomerus vulnerator*, Panz., and *Omorgus faunus*, Grav., the last three being parasites of various forest Lepidoptera. The Chalcid, *Tetrastichus xanthopus*, Nees, was reared from *D. pini*. Two hyperparasites are recorded, *Stilpnus blandus*, Grav., from *Muscina pabulorum* and *Orthostigma pumilum*, Nees, from *Aphiochaeta rufipes*.

DUSTAN (A. G.). **New Truck Pest in Ontario.**—*Canad. Hortic.*, Fruit & Truck edn., 1, no. 12, p. 263. Peterboro, Ont., December 1927.

The Mexican bean beetle [*Epilachna corrupta*, Muls.] is recorded for the first time from Ontario, where it occurred in various localities during the autumn of 1927. A short description is given of its various stages so that its presence may be recognised and reported immediately.

GUYTON (T. L.). **Insect Pests of the Household.**—*Bull. Penn. Dept. Agric.*, no. 432, pp. 3–12, 7 figs. Harrisburg, Pa., 1926.

Part of this popular account deals with insects attacking stored food and furniture, including *Musca domestica*, L., *Plodia interpunctella*, Hb., *Dermestes lardarius*, L., *Bruchus* (*Mylabris*) *obtectus*, Say, *Anthrenus scrophulariae*, L., *Attagenus piceus*, Oliv., *Lasioderma serricorne*, F., clothes moths, ants, termites, cockroaches, and the cricket, *Gryllus domesticus*, L. Notes are also given on the control of household pests by fumigation and superheating.

HINDS (W. E.) & SPENCER (H.). **Insecticidal Control for Sugarcane Borer.**—*Bull. Louisiana Agric. Expt. Sta.*, no. 201, 56 pp., 4 figs. Baton Rouge, La., August 1927.

The bulk of the information contained in this progress report on measures against *Diatraea crambidoides* has been already noticed [*R.A.E.*, A, xv, 440, 505].

HARRISON (P. K.). U.S. Bur. Ent. **Field Cricket Injury to Strawberries.**—*Quart. Bull. Miss. Pl. Bd.*, vii, no. 3, pp. 4–6, 2 figs. A. & M. College, Miss., October 1927.

The cultivation of strawberries is increasing rapidly in southern Mississippi, but they are attacked by several insect pests, the most destructive at present being *Gryllus assimilis*, F. (field cricket), which feeds on the fruit. The mulch necessary for the production of clean, marketable fruit provides an ideal shelter for the crickets. In view of the lack of further information, it is recommended that growers should plant in new land, in rows 3½–4 feet apart, and use as little mulch as possible. Grass and weeds should be destroyed during the entire growing and harvesting season.

Eburia quadrigeminata **perforates a Lead Pipe.**—*Florida Ent.*, xi, no. 3, p. 40. Gainesville, Fla., November 1927.

A case is recorded of the Cerambycid, *Eburia quadrigeminata*, Say, boring through the lead pipe carrying a telephone wire.

WATSON (J. R.). **The English Orchid Thrips native to Florida. Additions to Thysanoptera of Florida—xvi.**—*Florida Ent.*, xi, no. 3, pp. 41–42. Gainesville, Fla., November 1927.

Anaphothrips orchidaceus, Bagn., has been recorded from various orchids in the British Isles and from the palm, *Chamaedorea fragans*, in Belgium. During November and December 1926 it was recorded for the first time outside Europe, having been taken in Florida on a native orchid (*Epidendron*) from oak trees growing at some distance from greenhouses in which orchids are grown; it is therefore thought probable that this thrips is a native of semitropical and tropical America and that it has been introduced into Europe on orchids imported from there.

Chafer Beetles.—*Leafl. For. Comm.*, no. 17, 6 pp., 3 figs. London, November 1927.

A description is given of *Melolontha melontha*, L. (*vulgaris*, F.) (large chafer), *Amphimallus* (*Rhizotrogus*) *solstitialis*, L. (summer chafer) and *Serica brunnea*, L. (brown chafer). The life-history of these three beetles in Britain is similar, the eggs being laid in the soil between June and August, the larvae then hatching in 4 to 5 weeks and spending their life, which extends over a period of years, in the soil. In the case of *M. melolontha* the life-cycle from egg to adult probably lasts 4 years in the south of England and rather more in the north, in the case of *A. solstitialis*, three, and of *S. brunnea*, two. Until recently *M. melolontha* was thought to be the most destructive cockchafer in forest nurseries, but it has now been found that *A. solstitialis* and *S. brunnea* are equally, and in some places even more, harmful; the larvae of *Melolontha* gnaw and cut through the roots of seedlings, etc., while the other two merely girdle them, but are more difficult to control on account of the shorter period of their larval life. The damage caused is sometimes confused with that of Noctuids (cutworms), and the larvae should therefore be carefully searched for in the vicinity of the plants attacked. Damage by the adult beetles is not serious in Britain.

A characteristic of the life-cycle of these three beetles is the fact that there are so-called "flight years" during which numbers of the adults emerge and egg-laying becomes general. These periods can be predicted with reasonable certainty; 1930 and 1934 are expected to be major flight years. The swarming is, however, generally prolonged and irregular in England, and the control methods adopted on the Continent are therefore of no value; the application of gas lime is also unsuitable for nurseries, since soils are poisoned by it and cannot be replanted for a long period. The most effective method of control probably lies in the use of green crops such as lupine or mustard, and the adoption of a nursery rotation system, whereby the various sections can be thoroughly dug over and cleared of larvae by hand-picking. The larvae are most easily seen in the years preceding a swarm year, when they are especially large, but the heaviest losses occur in the second and third years following a heavy swarm, and hand-picking should therefore be carried out with great care during the winter and spring of these years. During the winter months, from about October to March, the larvae are at a depth of 3 ft. or more beneath the surface of the soil and only return to the upper layers on the approach of warm weather; this period necessarily varies in different localities, and the time when the largest number of larvae is in the upper soil levels should be determined, so that digging and hand-picking may be carried out to the best advantage. An injection of carbon bisulphide into soil which is lying fallow is an effective means of killing the larvae, and should also be employed for larvae damaging beds of coniferous seedlings. From 7 to 12 injections should be made to a square yard, using $\frac{1}{5}$ oz. at each injection. The beds should be inspected at regular intervals, wilting seedlings generally indicating the presence of larvae, although in very wet weather the wilting does not take place and the roots may be attacked so low down that the upper portions are left active; if the damage is severe, however, it will almost certainly be detected by careful inspection. An application of carbon bisulphide may in some cases be needed for the control of *S. brunnea* during the summer, since these larvae are small and liable to be overlooked; *S. brunnea* is most injurious from June to September, *M. melolontha* and *A. solstitialis* from April to July.

PICARD (F.). **Les origines de la faune de la vigne.**—*Feuille Nat.*, xlv, no. 2 (n.s.), pp. 25–27. Paris, April 1924.

Of the many insects that attack grape-vines in France there are very few that do not occur on any other plant. Among the indigenous species in this category are the Cerambycid, *Phymatodes fasciatus*, Vill. (*Callidium unifasciatum*, Ol.) and the Buprestid, *Agrilus derasofasciatus*, Lac., which are common in wild grape [*Vitis labrusca*] but rare in vineyards. Many vine pests, such as cutworms, *Otiorrhynchus*, *Peritelus*, etc., are polyphagous insects that are attracted to the large areas of this one crop and become abundant on it owing to the plentiful food supply. In other cases cultural practices lead to the invasion of vineyards by polyphagous insects; the Lygaeid, *Nysius senecionis*, Schill., occurs principally on *Diplotaxis erucoides*, but attacks vines when this and other weeds are destroyed by cultivation. The breaking up of new ground for vineyards and the consequent destruction of the indigenous flora have the same results; this is the cause of the attacks of the Cerambycid, *Vesperus xatarti*, Duf., on young vines in Spain and Rousillon, while in North Africa vines planted on ground from which dwarf palms [*Chamaerops humilis*] have been cleared are attacked by the Coccid, *Rhizoecus falcifer*, Künck., and the Prionid, *Cyrtognathus forficatus*, F. Vines planted in marshy ground are attacked by *Tortrix* (*Cacoecia*) *costana*, F., which has many food-plants, but is confined to very damp places.

Certain insects commonly supposed to be confined to the grape-vine have passed to it from other plants, but have acquired some degree of specificity. The vine moth [*Polychrosis botrana*, Schiff.] and the Pyralid, *Cryptoblabes gnidiella*, Mill., are apparently more attracted to *Daphne* than to vines; in Rousillon the author observed *D. gnidium* defoliated by *P. botrana*, while neighbouring vines were not attacked. Several insects attacking Onagraceae and Lythraceae also attack grape-vines; the four Sphingids that attack the vine also occur on

Epilobium and *Lythrum*, the race of the Eumolpid, *Bromius obscurus*, L., on vines differs only slightly in colour from that on *Epilobium*, and *Haltica ampelophaga*, Guér., which has been supposed to be confined to the grape-vine, can hardly be considered even varietally distinct from *H. lythri*, Aub., which occurs on *Lythrum*, *Epilobium* and *Oenothera*; the author has found that both larvae and adults of both forms of *Haltica* will feed on either *Epilobium* or vine, and has obtained descendants from matings between the two forms.

FAURE (J[ean] C.). **Sur la cécidomyie des violettes** (*Perrisia affinis* **Kieffer).**—*Feuille Nat.*, xlv, no. 9 (n.s.), p. 150, 1 ref. Paris, November 1924.

The gall-midge, *Dasyneura* (*Perrisia*) *affinis*, Kieff., is a pest of violets in the south of France. The author has noticed that it has a strong preference for *Viola odorata* where that species and *V. hirta* are both present. He found larvae in the rolled leaves in November, and the adults emerged from 29th April to the middle of May, all those in a gall usually emerging through a single aperture in the thickened part of the leaf. Hibernation takes place in the pupal stage, and there appears to be only one generation a year in the neighbourhood of Lyons.

FAURE (Jean C.). **Sur le déterminisme de la ponte chez** *Pimpla instigator*, **ichneumonide parasite de** *Pieris brassicae*, **L.**—*Feuille Nat.*, xlv, no. 10 (n.s.), pp. 153–157, 5 refs. Paris, December 1924.

Experiments to determine the stimuli governing the oviposition of *Pimpla instigator*, F., on the lines of those carried out by Picard [*R.A.E.*, A, ix, 425; x, 359], are described.

TROUVELOT (B.). **Sur les causes de disparition d'une petite invasion de** *Pegomyia hyoscyami* **Panz., survenue en 1924 dans le département de l'Oise.**—*Feuille Nat.*, xlvi, no. 14 (n.s.), pp. 54–56, 4 refs. Paris, April 1925.

In June 1924 a large field of beet in the department of Oise was heavily attacked by *Pegomyia hyoscyami*, Panz., and it was expected that the second generation would attack other fields in the vicinity. Each of 30 pupae of the first generation, however, produced an individual of the Braconid, *Colastes decorator*, Hal., and it was evident that parasitism amounted to nearly 100 per cent. in the field, as the pest disappeared completely. The author suggests that the infestation by *P. hyoscyami* originated from wild plants round the edges of the field such as *Chenopodium album*, which he has often found to be attacked by it, and that the parasite originated either from *P. hyoscyami* or from other mining larvae in wild plants. He urges the importance of studying the fauna of cultivated plants in relation to that of wild plants.

SUIRE (J.). **Sur quelques insectes de l'Hérault. (Diptères et Micro-lépidoptères.)**—*Feuille Nat.*, xlvii, no. 31 (n.s.), pp. 129–132. Paris, September 1926.

Flies reared from mines in the leaves of *Silene inflata*, and which oviposited in that plant but not in beet or *Chenopodium*, and others reared from spinach are apparently *Pegomyia hyoscyami* var. *nigricornis*, Strobl. Biological notes are given on a number of other insects including the Tachinids, *Erycia* (*Bactromyia*) *aurulenta*, Mg., bred from *Hyponomeuta* spp., and *Phryxe* (*Ceratochaeta*) *secunda*, B.B., from *T*[*haumetopoea*] *pityocampa*, Schiff. ; *Galleria mellonella*, L., parasitised by *Dibrachys cavus*, Wlk. (*boucheanus*, Ratz.) and *Apanteles hoplites*, Ratz. ; and the Tineids, *Symmoca signatella*, H.-S., which is abundant on elms but heavily parasitised by *Pimpla calobata*, Grav., a common parasite of the nut tortrix [*Cydia splendana*, Hb.], *Lithocolletis millierella*, Stgr., which is very injurious to *Celtis australis*, but is parasitised by *Colastes braconinus*, Hal., and *L. endryella*, Mén., on *Quercus ilex*, parasitised by *Apanteles sicarius*, Mshl., a common parasite of *Hemerophila* (*Simaethis*) *nemorana*, Hb.

PICARD (F.). **Les parasites de** *Galleria mellonella*.—*Feuille Nat.*, xlvii, no. 34 (n.s.), pp. 185–186, 2 refs. Paris, December 1926.

With reference to Suire's record of *Apanteles hoplites*, Ratz., as a parasite of *Galleria mellonella*, L., at Montpellier [see preceding paper], the author states that he himself reared a species of *Apanteles* from hives infested with *G. mellonella* in the same district in 1912, the habits of which agreed with those of *A. lateralis*, Hal., which is similar in colouration to *A. hoplites*. He questions the occurrence of two species of *Apanteles* as parasites of *G. mellonella*, more especially as *A. hoplites* is exceptional for the genus in that it attacks Coleoptera ; the author has bred it from galls of *Saperda populnea*, L.

RABAUD (E.). **Sur le régime alimentaire des larves de** *Chrysopa vulgaris*.—*Feuille Nat.*, xlvii, no. 33 (n.s.), pp. 164–167, 1 ref. Paris, November 1926.

The author frequently observed larvae of *Chrysopa vulgaris*, Schn., on flowers where no Aphids were to be found, and on close examination discovered that they imbibed liquid from the nectaries. This was confirmed a number of times by placing larvae near drops of sweetened water, which they drank completely in every case ; drops of pure water had little attraction for them. The author considers that the larvae of *C. vulgaris* can probably reach maturity by feeding on the nectar of flowers alone, and he points out that Aphids, which are their preferred prey, mostly secrete a sweet liquid not unlike nectar.

EFFLATOUN (H. C.). **On the Morphology of some Egyptian Trypaneid Larvae (Diptera), with Descriptions of some hitherto unknown Forms.**—*Bull. Soc. ent. Egypte*, 1927, fasc. 1, pp. 17–50, 9 figs., 1 chart, 8 pls., 72 refs. Cairo, 1927.

The larvae of 19 species of the Trypetids occurring in Egypt [*R.A.E.*, A, xiii, 278] have been obtained ; of these 16 have not been previously described. Descriptions are here given of their final stage and of the pupae. A table is also given of the main characters of all the known larvae, and the general characters of Trypetid larvae are discussed. The geographical distribution and food-plants are indicated of the species described, which are : *Dacus oleae*, Gmel. which has been definitely recorded from Egypt since 1925 [*cf. loc. cit.*], *D. longistylus*, Wied., *Carpomyia incompleta*, Beck., *Ceratitis capitata*, Wied., *Spheniscomyia debskii*, Effl., *S. filiola*, Lw., *Myopites variofasciata*, Beck., *Oedaspis trotteriana*, Bez. (recorded for the first time from Egypt), *Schistopterum moebiusi*, Beck., *Terellia jaceae*, R.-D., *T. planiscutellata*, Beck., *Sphenella marginata*, Fall., *Spathulina parceguttata*, Beck., *Euaresta iphionae*, Effl., *Tephritis desertorum*, Effl., *T. pulcherrima*, Effl., *Trypanea augur*, Frfld., and *T. stellata*, Fuessly.

COTTERELL (G. S.). **Pests of Cocoa in the Gold Coast.**—*Proc. 1st. W. Afr. Agric. Conf. Ibadan, Nigeria, March 1927*, pp. 98–112. Lagos, 1927.

The great increase in deforestation in the Gold Coast since cacao-growing became general, together with several years of abnormal climatic conditions, have largely augmented the number of pests attacking cacao. The most important of these are the Capsids, *Sahlbergella singularis* and *S. theobroma* [*R.A.E.*, A, xiv, 570]. The nymphs of *S. singularis* are parasitised by the Braconid, *Euphorus sahlbergellae*, sometimes to the extent of 8 per cent., but the parasite is itself attacked by the Ichneumonid, *Mesochorus melanothorax*, and is never likely to be very efficient. Excessively humid conditions, such as occur in the wet season in the cacao belt, are necessary for the breeding of the parasite. Native growers will not take much trouble over artificial measures of control. Cacao should be limited to suitable situations, and unremunerative farms should be destroyed. Hand collection should be practised while nymphs and adults are concentrated on the pods, and a strong kerosene or nicotine wash applied at this time would be effective. On the whole, damage to cacao is more often observed on light sandy soil than on heavy loam. Another difficulty in remedial measures is that by the time damage becomes apparent the insects have left the plant.

Another Capsid, *Helopeltis bergrothi*, confines its attacks to maturing pods, and unless they are attacked at an early stage they mature normally. A small area round each puncture in the pericarp rapidly dies, and a corky scab is formed. The bugs are most prevalent during abnormally dry periods and attack cacao on unshaded areas where unsuitable soil conditions occur. The soft shoots of young cacao are occasionally attacked by the adults if other food-plants on which the nymphs can feed are present. The eggs are laid in batches, in pod cushions, peduncles and in the pods and hatch in about 14 days. The nymphal stage averages from 17 to 22 days, and adults have been kept alive in captivity for 3 months. About 50 food-plants have been recorded, of which the most important are *Ipomoea* spp. and *Hibiscus*. The nymphs are attacked by a Hymenopterous parasite. Remedial measures include better cultivation, the provision of sheds and drainage, and, if necessary, the provision of a cover crop to protect the soil.

Heliothrips rubrocinctus is rapidly becoming one of the most important pests. It is encouraged by poor soil conditions and attacks the secondary foliage appearing after attack by *Sahlbergella* ; it is invariably found on unshaded cacao growing on soil that is sometimes waterlogged. On young trees the foliage may be entirely destroyed during the dry season. The adults and nymphs cause die-back by sucking the lower surfaces of the leaves, and the maturing pods that are attacked become russetted, rendering it difficult to tell when they are ripe and resulting in many unripe pods being gathered. The eggs are deposited on the lower leaf surface and hatch in a day or two, the nymphal stage occupying from 11 to 15 days. Among the wide range of food-plants, the favourite are *Kola acuminata* and *Eriodendron*. There are numerous predacious enemies and an unidentified Chalcid parasite, which may attack as many as 70 to 80 per cent. of the thrips. In San Thomé, *H. rubrocinctus* is the most important pest of cacao ; probably the Chalcid parasite does not occur there, and its introduction might result in effective control of the thrips. The recommendations for preventing damage by thrips are the provision of adequate shade, wind-breaks and drainage.

A small Noctuid, *Characoma stictograpta* (cacao pod-borer) deposits its eggs at the proximal end of maturing pods, the larvae tunnelling into the pericarp until ready to pupate. Pupation occurs in the frass that is piled up outside the entrance to the tunnels. The beans themselves are never attacked. This pest is one of the main factors in the dissemination of pod diseases. It occurs particularly on densely shaded areas and is not secondary to bad cultural conditions. The Longicorns, *Glenea* spp. and *Mallodon downesi*, are also major pests of cacao, the latter having become so in the last few months, probably in consequence of the destruction of forest trees. Damage by it is confined to the main stem and the main lateral branches. There is no external sign of attack until the tree begins to die, and as there are no frass holes the actual position of the larvae cannot be located. *Glenea* spp. attack the main stems of the older trees, usually at the collar. The larvae tunnel in all directions just under the bark, infested trees being easily recognisable by the frass, and the larvae can be cut out without undue damage to the tree.

Minor pests of cacao, which are generally secondary to unfavourable conditions, include the Noctuid, *Earias biplaga*, which generally follows attack by *Sahlbergella* or thrips, the eggs being laid singly on the bracts of developing shoots. The larvae bore into the leaf-buds, and later on attack the new foliage and sometimes the bark of the young shoots. Pupation occurs on the leaves and twigs. Only unshaded trees are attacked. There is an unidentified Braconid parasite, which is heavily hyperparasitised. The Rutelid, *Adoretus hirtellus*, and the larvae of the Arctiids, *Diacrisia rattrayi* and *D. mundata*, occasionally attack the foliage. The Aphid, *Toxoptera aurantii*, attacks the suckers and the secondary foliage following attack by other insects ; it is largely controlled by larvae of the Syrphids, *Paragus marshalli* and *P. borbonicus*, and by the Coccinellid, *Novius* sp. Secondary foliage is frequently heavily infested by the Psyllid, *Mesohomotoma* (*Udamostigma*) *tessmanni*, which oviposits in pits in the bracts and developing leaf-buds and in young stems, the attack being limited to young trees lacking adequate shade and in poor soil conditions. Larvae of the Syrphids, *Baccha sinuata*, *B. praeusta* and *B. picta*, are predacious on it. Occasional or rare pests are the Coreid, *Homoeocerus pallens*, which causes practically the same damage to pods as does *Helopeltis* ; the Coccid, *Stictococcus sjöstedti*, attacking the pods and peduncles ; and two species of the Membracid genus *Gargara*. Besides minor stem borers (*Xyleborus nitidipennis*, *X. urichi*, etc.), which only attack moribund trees, the larvae of the Longicorns, *Tragocephala gorilla*, *T. chloris* and *Armatosterna buquetiana*, and of the Cossid, *Engyophlebus obesus* (*Eulophonotus myrmeleon*), occasionally attack healthy cacao. In one locality, the roots of healthy young cacao trees are completely destroyed by a species of termite.

Stored cacao beans are attacked by the larvae of *Ephestia* sp. and *Araecerus fasciculatus*, but both are dependent on dark and humid conditions in storage, and cacao is never stored for any length of time.

Except for *Sahlbergella* spp. and *Characoma* sp., all the above pests can be reduced in numbers by better cultural methods. It is useless to expect farmers to spray or dust, but if artificial methods must be resorted to, nicotine dust is suggested for use against *Sahlbergella* because it can be made locally without water.

In the discussion following this paper, W. H. Patterson is quoted as recording the finding of three individuals of *Sahlbergella* in Fernando Po, where it had not been previously known.

HARGREAVES (E.). **Some Insect Pests of Sierra Leone.**—*Proc. 1st W. Afr. Conf. Ibadan, Nigeria, March 1927*, pp. 113–128. Lagos, 1927.

Many of the pests in Sierra Leone are the same as those occurring in Nigeria and the Gold Coast. Those on cacao include the Cossid, *Engyophlebus obesus*, Karsch, an unidentified beetle that bores into the stems of seedlings, sometimes killing 10 per cent. or more in the nursery, and the Psyllid, *Mesohomotoma* (*Udamostigma*) *tessmanni*, Allm., which is of rare occurrence. *Citrus* is defoliated by *Papilio demodocus*, Esp. (which is controlled by hand picking or by spraying with a stomach poison), while the flea-beetle, *Cercyonia citri*, Bryant, eats the new leaves, the larvae boring into the shoots and killing the growing points. Limes are chiefly affected and sometimes orange and lemon ; slight pruning and destruction of the pruned shoots are recommended. The Coccid, *Dinaspis annae*, Malen., kills the young growth and spoils the fruit ; it is sometimes attacked by the fungus, *Pseudomicrocera henningsii*, which is the conidial stage of *Nectria diploa*, and by *Cephalosporium lecanii*. The mussel scale [*Lepidosaphes beckii*, Newm.] affects chiefly oranges and lemons, its fungus enemies being *Microcera* sp., and *Podonectria coccicola* and its conidial stage, *Tetracium coccicolum*.

On coconut, the chief pest is the coconut scale, *Aspidiotus destructor*, Sign. [*R.A.E.*, A, xv, 22], the enemies of which include the Coccinellids, *Chilocorus schiödti*, Muls., *C. dohrni*, Muls., *Hyperaspis senegalensis*, Murr., and a minute black species, each of which is abundant in various localities, a Chalcid, and the fungi, *P. henningsii* and *Cephalosporium lecanii*. Cultivation of the ground within a radius equal to that of the leaves and the application of a grass mulch is advised against this Coccid, but trimming the infested leaves is not recommended. Other pests of coconut are *Aspidiotus elaeidis*, March., *A. gowdeyi*, Newst., *Ctenochiton arborescens*, Lg., *Pinnaspis buxi*, Bch., *Selenaspidus articulatus*, Morg., and *S. kamerunicus*, Ldgr. Derbids that may prove important in the dissemination of fungous diseases include *Diostrombus* (*Camma*) *dilatatus*, Westw., *D. nitidus*, Muir, *Kamendaka albomaculata*, Muir, *Lydda cocos*, Muir, and *Proutista fritillaris*, Boh. The coconut borers, *Oryctes owariensis*, P. de B., *O. erebus*, Burm., and *Archon centaurus*, Burm., attack almost exclusively palms less than 4 years old, but occasionally breed in old ones, so that all dead palms should be felled and destroyed. *Rhina afzelii*, Fhs., bores into the living trunk. *Zonocerus variegatus*, L., and *Coelaenomenodera elaeidis*, Maulik, are occasional defoliators but do no great damage.

Coffee is fairly free from pests, but a small boring beetle causes dying back of twigs bearing fruit or buds ; the affected parts should be trimmed and burnt in the early stages of attack. Ginger is attacked by an undetermined Coccid that infests the rhizomes and continues to breed when the ginger is stored. Fumigation with hydrocyanic acid gas for 1½ hours gives good results and should be done before distribution for planting. Stored ginger is also affected by *Lasioderma serricorne*, F., *Araecerus fasciculatus*, DeG., and *Silvanus surinamensis*, L., which reduce the entire inside of the rhizomes to frass, though only one or two small holes are visible to the exterior. Groundnuts [*Arachis hypogaea*] appear to be attacked only by an Aphid, which is important in view of the fact that rosette disease frequently occurs with it; this Aphid is attended by ants and is preyed upon by a Coccinellid.

Kola [*Cola acuminata*] is often heavily infested by the nut weevil, *Balanogastris kolae*, Desbr., the losses sometimes amounting to 50 per cent. of the crop. Eggs are deposited at the rate of 9 or 10 a day just below the surface of the nuts or in the sides of the cavities formed by the feeding of larvae and adults. The incubation period lasts 5–6 days, the larval and pupal stages 14–52 days or more, and the pre-oviposition period 3 days; adults lived in captivity for 66 days, or from 9 to 16 days without food. Infestation has only been observed in pods that have split, and the occurrence of the weevil seems to be dependent on the presence of high bush. *Mesohomotoma tessmanni* attacks particularly the young growth, leaves, flowers and nuts, causing them to fall, the leaves acquiring large dead areas in consequence of the punctures. The eggs have not been observed and cannot be reached by a spray. The Capsid, *Torma colae*, China, appears to carry on complete development inside the flower-buds, but little is known about this insect. Defoliators include the leaf-roller, *Sylepta semilugens*, Hmps., the Noctuid, *Lophocrama phoenicochlora*, Hmps., and occasionally the beetles, *Lycus sinuatus*, Schönh., *Mylabris seminigra*, Voigts, and *Nisotra spadicea*, Dalm. The nuts are infested by a moth larva and by *Araecerus fasciculatus*, and the pods by the fruit-fly, *Ceratitis* (*Pterandrus*) *colae*, Silv., which is frequently followed by weevil damage. Stem borers are *Engyophlebus obesus*, and the Lamiid, *Glenea giraffa*, Dalm. Among Coccids, the most harmful is *Saissetia subhirsuta*, Newst., which attacks the fruit, arresting growth and causing malformation. The trees are sometimes affected by big bud when many mites are present, and these are probably the cause.

Maize is not largely grown; its most serious pest is a Pyralid, probably *Eldana saccharina*, Wlk., which attacks both stem and cob, and a Lepidopterous stem-borer. Insects attacking cobs that have been damaged by birds include *Diplognatha gagates*, Forst., and the Nitidulids, *Carpophilus dimidiatus*, F., and *Brachypeplus pilosellus*, Murr. Stored maize is attacked by the usual pests, including *A. fasciculatus*, which apparently occurs also in the field.

The oil palm [*Elaeis guineënsis*] is remarkably free from serious pests. Nuts that have fallen or had the pericarp removed are attacked by the Scolytids, *Coccotrypes perditor*, Bldf., and *C. pygmaeus*, Eich., which bore through the hard shell and consume the kernel. The mealybug, *Pseudococcus brevipes*, Ckll., is sometimes very numerous on the fruit heads, but is not visible as it is covered over with earth by ants. The weevil, *Temnoschoita quadripustulata*, F., has been found in decaying palms and also, in company with *Rhina afzelii*, in the trunks of those damaged by fire. Other oil palm pests include all the Derbids recorded above on coconut except *P. fritillaris*, as well as others such as *Diostrombus* (*Camma*) *luteus*, Muir, *Levu africana*, Muir, etc. [*loc. cit.*]. Various Coccids include *Aspidiotus destructor* (on palms in the vicinity of coconuts) *A. elaeidis*, March., and *A. cyanophylli*, Sign. Rice is sometimes infested by earwigs to the extent of about 10 per cent. of the crop.

The locust, *Zonocerus variegatus*, L. [*R.A.E.*, A, xv, 488] does a great deal of damage ; in the later part of the season cultivated crops such as breadfruit, *Citrus*, cassava and cotton are devastated. The time of appearance of the first young hoppers varies from late September to January. As the season progresses there appears to be a gradual general movement of hoppers in an easterly direction, but this may be only a coincidence and it would be interesting to know what happens in other countries. No natural enemies have been observed.

Coconut and other palms and *Citrus* trunks are sometimes heavily attacked by termites, generally up to 3 ft. from the ground ; a wash made of 1 lb. quicklime (slaked in as little water as possible) to ½-lb. lead arsenate painted on the trunks seems to be effective for many months ; the band of paint should not be less than one foot wide.

GOLDING (F. D.) & LEAN (O. B.). **Nigerian Insect Pests of Cotton.**—*Proc. 1st. W. Afr. Conf. Ibadan, Nigeria, March 1927*, pp. 129–145. Lagos, 1927.

The work that has been done in recent years in Nigeria against the cotton pests occurring there is outlined [*R.A.E.*, A, xii, 67 ; xiii, 16, 169 ; xiv, 320–325]. During the season 1925–26 an intensive survey was carried out on *Gossypium hirsutum* and two native varieties of cotton. The method adopted is described. The percentage of buds shed compared with the number produced was rather less on *G. hirsutum* than on the native cottons. With regard to boll shedding, on *G. hirsutum* most of the bolls shed before they were a week old were shed as a result of direct insect attack, but most of the shedding of bolls of one to two weeks old may be assigned to physiological causes, and about 30 per cent. of the total shedding was of bolls of this age. Moreover, of the total shedding, 60 per cent. was of bolls under one week old, and the conclusion was reached that if these had not been shed through insect attack about the same number would have been shed from physiological causes during the subsequent week of their development. On the native varieties, insects undoubtedly cause a large amount of shedding, the total shedding on one variety [*G. vitifolium*] averaging 50 per cent. while on the other [*G. peruvianum*] it averaged 40 per cent. A survey of the harvested bolls demonstrated quite definitely the factors that had inhibited the production of undamaged bolls. The results, however, are found to vary from year to year and in different localities. In the majority of surveys of *G. hirsutum* the numbers of locks damaged by stainers (*Dysdercus* spp.) exceeded those damaged by bollworms. On *G. peruvianum* bollworm damage was generally in excess of that by *Dysdercus*, but as with *G. hirsutum*, where the total damage was great, *Dysdercus* proved to be the dominant factor. In the few surveys of *G. vitifolium* that were made, *Dysdercus* was more injurious than bollworm. It would seem, therefore, that *Dysdercus* is the most serious factor in preventing a good cotton crop. With regard to the spread of insects from one variety of cotton to another, examination has shown that until the bulk of the bolls of *G. hirsutum* have matured, there is little increase in the infestation of stainers on native cotton grown between the plots of this variety, but that after they have matured, the increase in infestation on the native cotton is marked. A fuller account of work on the bionomics of the more important species of *Dysdercus* has been noticed above [*R.A.E.*, A, xvi, 233]. The bollworms occurring in southern Nigeria, where the pink bollworm [*Platyedra gossypiella*, Saund.] has not yet been found, are discussed, as well as some minor cotton pests [xiv, 323, etc.].

The control of *Dysdercus* by biological methods offers little hope of success, as in no part of the world do natural enemies form an effective check ; close season methods and the use of poisons by native farmers are both impracticable. The Botanical Section of the Nigerian Agricultural Department has produced, by selective breeding, strains of *G. vitifolium* with lint characters superior to those of *G. hirsutum*, and as fewer stainers are found on *G. vitifolium* than on exotic cotton, it seems highly probable that this indigenous species would be comparatively immune from *Dysdercus* when grown, according to the native custom, on small intercropped areas.

In the discussion following this paper it was stated that a food-plant that is of considerable importance to *Dysdercus* in south Togoland is the fruit of the baobab (*Adansonia* sp.). The insects are attracted to the pods as soon as they fall and open, exposing the seeds. Fruits are available for food at most times of the year [*cf.* also xvi, 156].

JACK (R. W.). **Tobacco Pests of Rhodesia.**—*Rhodesia Agric. J.*, xxiv, no. 12, pp. 1235–1246, 5 pls. ; xxv, no. 1, pp. 13–25, 6 pls. ; also as Bull. 665, 24 pp., 11 pls. Salisbury, Rhodesia, December 1927 and January 1928.

This is a revision of a previous paper on the tobacco pests of Rhodesia [*R.A.E.*, A, viii, 134, 193]. The bulk of the additional information in regard to remedial measures has already been noticed from other sources [*R.A.E.*, A, vi, 214 ; xiii, 39, 524 ; xv, 522, 628]. Ploughing, harrowing and rolling of the ground as a preventive measure against *Heliothis obsoleta*, F., previously recommended to be carried out before October, should be effected before September. A bait consisting of maize bran, moistened with a mixture of 1 lb. sodium arsenite in 20 gals. water, placed in balls on infested fields at the rate of one ball to every 10 plants, or 16 lb. bran to the acre, has proved successful in the control of *Gonocephalum* and other Tenebrionids.

PARSONS (F. S.). *Syagrus rugifrons*, **Baly: a Chrysomelid Beetle attacking Cotton Plants in Natal; and Measures for Seasonal Control.**—*Emp. Cott. Grg. Rev.*, v, no. 1, pp. 13–16. London, January 1928.

Syagrus rugifrons, Baly, has caused considerable damage to cotton plants in parts of Natal, and has increased in numbers with the expansion of cotton growing. Though in the past its attacks have been local, recurring in the same place in succeeding seasons, a few individuals may be found in almost every field. Cotton seedlings are attacked by the adults, which feed on the stems and leaves, from October to late December, the main infestation taking place in November ; in 1925 and 1926 the beetles practically disappeared in December, but a few were observed in January, and in February there was a mild attack on some late planted cotton. About 14 days after the commencement of the main attack many patches of seedlings are dead in heavily infested fields, although the damage done by beetles feeding on the large plants is slight. In November 1925 an 80 acre field suffered a loss of 60 per cent. of the crop from the attack of *S. rugifrons* ; if land that has been infested in this way is resown with cotton in early December, little signs of the adult beetle are seen on the crop, but a number of the plants die owing to infestation of the roots by the larvae. The larvae are usually found near or along the main roots close to the nodes of the upper secondary roots of the plants, about 5–18 ins. below the surface ; deep channels are eaten into the root, and when the main root is attacked, the plants are killed very rapidly. The injury sustained in this way usually becomes evident some weeks after the attack by the adults. Pupation takes place in the soil at a depth of from 4 to 18 ins. The author has been unable to induce the adult beetle to fly, although it is reported to have been seen in flight ; as a rule when it is dislodged from a leaf it remains motionless until the observer has moved away, when it rapidly seeks shelter under fallen leaves or lumps of soil ; during the heat of the day the beetles may also be found in these places or in curled leaves that have withered as a result of their feeding. Occasional beetles have been found under clods of earth in mid-winter, and it is therefore presumed that hibernation takes place in the adult stage.

S. rugifrons may be controlled by dusting with commercial mixtures of Paris green, lead arsenate or calcium arsenate ; this last is the cheapest in South Africa, and the mixture used consisted of calcium arsenate containing 40 per cent. AS_2O_5, and a carrier, 5 lb. being sufficient for an acre. One application of this mixture in 1926 over a very heavily infested area of 20 acres gave an estimated control of 90 per cent., but the cost is high.

HEWISON (H. K.) & SYMOND (J. E.). **Observations on a Fungus Disease and an Insect Pest of Cotton.**—*Emp. Cott. Grg. Rev.*, v, no. 1, pp. 48–53. London, January 1928.

In observations in Trinidad on *Dysdercus howardi*, Ballou, and *Dysdercus howardi minor*, Ballou, the latter occurred slightly later in the season than the former, but in approximately equal numbers. The infestation of different varieties of cotton attacked by *Dysdercus* is discussed ; the varieties did not differ in susceptibility, the order in which they were infested depending on the degree of maturation. Differential sowing does not seem to affect this order nor does it reduce liability to attack. It is suggested that an Asiatic variety of cotton (Cawnpore), which is the earliest to be infested and on which the insects are easily seen, might be used as a trap-crop by interplanting it with the other cottons and collecting the bugs as they occur on it.

JOHANNSEN (O. A.). **A New Midge injurious to Pineapples (Diptera, Ceratopogoninae).**—*Proc. Ent. Soc. Wash.*, xxix, no. 9, pp. 205–208, 1 pl. Washington, D.C., December 1927.

The larva, pupa, and both sexes of the adult of *Apelma brevis*, sp. n., are described from Hawaii, where it is a troublesome pest of pineapple plants. This midge breeds in the water pockets in the axils of the leaves. The larvae make slight scars on the very tender, white tissue of the leaf, and bacteria entering these scars cause a rot of the whole plant.

FULLAWAY (D. T.). **Notes on Litchee Insects.**—*Lingnaam Agric. Rev.* iv, no. 2, pp. 173–174. Canton, China, October 1927.

Litchee (*Nephelium litchi*) is extensively grown in the vicinity of Canton and Hong Kong, but although the trees may blossom profusely, the crop is often very light. These light crops have, until recently, beeen ascribed to unfavourable weather conditions, but are now found to be caused by a Lycaenid, *Deudorix epijarbas*, Moore, which is also believed to occur on a wild species of *Nephelium* in the Philippines. The scarcity of the fruit in 1925 was almost entirely due to its attacks. The larvae enter the fruit when it is quite small, with the result that a great deal falls to the ground in an immature condition ; they leave it to pupate, attaching themselves to the surface on which they are resting by a slender thread. The Tortricid, *Cryptophlebia* (*Argyroploce*) *illepida*, Butl., also attacks this fruit ; it is widely distributed, and specimens collected in Australia, India, South Africa and Southern China can, it is believed, all be referred to this species. It has already been reported from Hawaii [*R.A.E.*, A, xv, 450] where the following pests of litchee also occur : *Eriophyes* sp., which may cause severe injury to the leaves ; and the Coccids, *Aulacaspis major*, Ckll., and *Fiorinia nephelii*, Mask., which are common but not very troublesome, *Saissetia hemisphaerica*, Targ., which attacks weak trees, and a mealybug, probably *Geococcus radicum*, Green, which infests the roots of layering plants.

URBINO (C. M.). **The Sugar Cane Leaf-Hopper,** *Perkinsiella vastatrix*, **Breddin (Delphacidae, Homoptera).**—*Philipp. Agric.*, xvi, no. 7, pp. 397–432, 2 pls., 3 charts, 14 refs. Los Baños, December 1927.

Perkinsiella vastatrix, Bred., though at present adequately controlled by natural enemies, is potentially a serious pest of sugar-cane in the Philippines, where occasional outbreaks occur. All its stages are described. It is apparently confined to the Oriental Region and Japan, and is probably a native of the Philippines. The original food-plant there was probably *Saccharum spontaneum indicum*, which was apparently abandoned on the introduction of sugar-cane, since it is not now attacked. *Sorghum* is an additional food-plant in Java, and maize in the Federated Malay States. The injury to cane, which is caused by the feeding of the nymphs and adults as well as by oviposition, consists of lesions in the upper surface of the leaf mid-ribs and in the stems, often followed by secondary complications due to the invasion through the wounds of pathogenic micro-organisms. Sugar-cane generally becomes susceptible to attack when it begins to stool, canes that are nearly ready to harvest being relatively free from attack. The average life-cycle lasted from 39·5 days in September and October to 57·7 days in January and February. The pre-oviposition period varied from 2 to 25 days. The eggs are inserted under the epidermis of the leaf, from six to over 1800 eggs being found in a single leaf. The average length of the incubation period was 13·9 days in the sun, and 17·3 days in the shade. The average length of the entire nymphal stage was 19·3 days. Both nymphs and adults are semi-gregarious, but while the former remain stationary on one feeding area, the latter usually migrate to other plants or to other positions on the same plant. Five generations were observed in one year in the open and six in the shade. In confinement *P. vastatrix* continued to develop from July to April in the open and for two months longer in the shade, after which it could not be kept alive. During May, June and July, it was also absent from the fields and probably entered some dormant stage, which was probably due to the absence of rainfall, coupled with high temperature and relative humidity, and the tough condition of the canes. In nature *P. vastatrix* first appeared in noticeable numbers in September, was most abundant in November, decreased in January and became very scarce in March. Natural enemies found in the course of the observations include : two species of egg-parasites, a Mymarid and a Proctotrupid ; a Capsid that punctures and sucks the eggs and is also predacious on the nymphs and adults ; a fungus infecting both nymphs and adults ; and the Forficulids, *Proreus simulans*, Stål, and *Chelisoches morio*, F., the Staphylinid, *Paederus fuscipes*, Curt., and Attid spiders, which are all predacious. The most effective of these was apparently the Mymarid, which parasitised the eggs to the extent of from 17·68 to 98·63 per cent.

Control measures suggested include planting resistant or less susceptible varieties of cane, encouraging native natural enemies, and importing exotic species. Rotation of crops would only be advisable if effected uniformly over large areas.

MILLER (D.). **The Gum-tree Weevil and its Parasites. Preliminary Control Work in New Zealand.**—*N. Z. J. Agric.*, xxxv, no. 5, pp. 283–289, 7 figs. Wellington, 21st November 1927.

Gonipterus scutellatus, Gyll. (eucalyptus weevil) has recently become of major importance as a pest of *Eucalyptus* in New Zealand. During the winter the adult weevils collect in large numbers under the loose bark on the bole of the tree, especially of blue-gum (*E. globulus*), where the best shelter is found. Hibernation occurs from May to August or September, after which the weevils migrate to the young foliage for oviposition. At first the eggs are most abundant on blue-gum, but later occur on other species of *Eucalyptus*. Egg-laying continues until November. The larvae feed on the foliage, making narrow slits in it, and after about 4–5 weeks enter the ground for pupation. The pupal period lasts 3 or 4 weeks, the complete cycle from oviposition to the emergence of the adult requiring 8–12 weeks. The summer brood of weevils is abundant in December and January, particularly on *E. globulus* and *E. viminalis*. The eggs are laid, and by March and April the larvae are ready to enter the soil for pupation. The adults migrate to their winter quarters on blue gum.

The adults feed on the foliage and tender shoots, as well as on the epidermis of the older ones. The autumn brood of weevils also does some damage to growing apples, principally attacking the stalk, but often the epidermis.

A Mymarid that parasitises the eggs of the weevil has been discovered in Australia, and a consignment of parasitised eggs was sent to New Zealand. Some of the parasites had emerged before arrival and were dead, but others were still emerging and were placed with weevil eggs, which they attacked immediately. There is every prospect that the parasite will become established in New Zealand. Though no hyperparasites have been found in Australia or in material sent to South Africa, a Chalcid has been bred from that received in New Zealand. Its relation to the Mymarid, if any, is being studied.

KOPP (A.). **Rapport du Directeur intérimaire.**—*9me Rapp. Sta. agron. Guadeloupe 1926–27*, pp. 1–60. Pointe-à-Pitre, 1927.

During experiments with green manure plants in Guadeloupe, various insect pests were observed, including *Utetheisa ornatrix*, L., on all species of *Crotalaria* [*cf. R.A.E.*, A, xv, 97]. In some cases more than 70–80 per cent. of the seeds are destroyed by the larvae. Varieties that reach maturity in January and February are less attacked than those ripening in October or November. Records of insects attacking green manure plants in other countries are also given. Neither *Indigofera* spp. nor the three introduced species of *Tephrosia* appear to be attacked by insects in Guadeloupe. *Coccus viridis*, Green, and *Leucoptera* (*Cemiostoma*) *coffeella*, Guér., are recorded on coffee.

TOWNSEND (C. H.T .). **Informe de la Sección de Entomologia.** [Report of the Entomological Section of the Agricultural Experiment Station of the National Agrarian Society of Peru.]—*Informe Estac. exp. agric. Soc. nac. agrar.*, no. 1, pp. 1–8, 3 pls. Lima, October 1927.

The pests observed in the Montaña region of Peru included the weevil, *Metamasius hemipterus*, attacking sugar-cane, and *Heliothis* (*Chloridea*) *obsoleta* attacking maize.

TOWNSEND (C. H. T.). **El piojo blanco** (*Hemichionaspis minor*). **Los gusanos cortadores y su control. La melaza del algodón** (*Aphis gossypii*). [The White Scale, *Pinnaspis minor*. Cutworms and their Control. The Sugary Secretion of *A. gossypii* on Cotton.]—*Circ. Estac. exp. agric. Soc. nac. agrar.*, no. 1, 4 pp.; no. 3, 4 pp., 4 figs.; no. 4, 3 pp. Lima, 1927.

In 1909 *Pinnaspis* (*Hemichionaspis*) *minor*, Mask., threatened the extinction of cotton growing in the coastal region of Peru, but it has been checked by native and imported parasites. The use of insecticides and of early varieties of cotton are recommended against it. Cutworms are usually controlled by natural enemies, but if necessary, soil-fumigation with calcium cyanide or poison-baits may be employed. *Aphis gossypii*, Glov., is easily controlled by sprays or dusts containing nicotine, and a dust made by mixing 2 lb. liquid nicotine sulphate (40 per cent.) with 32 lb. calcium arsenate is effective against the Aphid, leaf-eating caterpillars, etc.

ROBINSON (W.). **Low Temperature and Moisture as Factors in the Ecology of the Rice Weevil,** *Sitophilus oryzae*, **L., and the Granary Weevil,** *Sitophilus granarius*, **L.**—*Tech. Bull. Minn. Agric. Expt. Sta.*, no. 41, 43 pp., 23 figs., 34 refs. St. Paul, Minn., September 1926. [Recd. 1928.]

The following is taken from the author's summary: A description is given of the methods and the equipment used in the experiments; and the various aspects of the subject are outlined. In a series of abrupt exposures, where the temperatures were dropped suddenly, there was a well marked correlation between length of exposure and percentage of mortality. Neither species is able to endure dormancy. *Calandra* (*Sitophilus*) *oryzae*, L., becomes dormant at approximately 7·2° C. (45° F.) and *C.* (*S.*) *granaria*, L., at 1·6° C. (35° F.); and in this condition they perish in 17 and 38 days respectively. During exposure to low temperatures, a continuous loss of weight occurs with each species, and this loss is regular and constant. The gradual approach of cold weather, which " hardens " hibernating insects and enables them to survive the very low temperatures of winter, has the opposite effect upon grain weevils (and probably the whole group of non-hibernating insects) and causes death to occur more rapidly. If the period of dormancy is broken and the beetles are placed in a normal environment before death occurs, the accumulated injury can be overcome. In addition, the original vigour can be increased if the new environment is a more favourable one.

The moisture content of grain has a marked effect upon the moisture content of the weevils. Those living in moist grain had the lowest moisture content, and a decrease of moisture in the wheat caused an outstanding increase in that of the weevils. Weevils living in moist grain gain in weight while those in dry wheat continually lose weight. The freezing points of grain weevils are affected by the moisture content of the grain upon which the weevils feed, dried wheat raising and moist wheat lowering their freezing points. *C. oryzae* is more sensitive to dryness in wheat than *C. granaria*, but neither can endure a moisture content as low as 8·2 per cent. Probably 14·0 per cent. is necessary for *C. oryzae* while *C. granaria* can endure 12·5 per cent. or slightly less. The optimum has not been definitely ascertained, but is possibly about 17·5 per cent. The maximum is probably not more than 25 per cent., for above that amount, a complication sets in by the production of carbon dioxide through increased respiration, which is injurious to the weevils. In the experiments on the attractiveness to weevils of wheat of various moisture contents, it was found that moist wheat attracts and dry wheat repels. Dry wheat causes death of the weevils, not because of the hardness of the grain covering and the difficulty of obtaining food, but through lack of moisture, which brings about a breaking down of the fatty tissues of the weevils to supply the moisture required. The moisture content of the wheat has been found to affect the ability of the weevils to resist low temperatures. Moist grain increases and dry grain decreases resistance. Moisture-retaining capacity was tested by desiccation of tissues immediately after death. *C. oryzae* loses its moisture content in four days while *C. granaria* retains some moisture for eleven days. Weevils raise the moisture content of the wheat upon which they feed, and this results in the formation of a chain of conditions each of which reacts upon the weevils themselves. A chart is shown on which are plotted temperatures of grain in a terminal elevator in Minneapolis. This covers a period of seven months and shows that by running the grain from one tank to another during cold weather the temperature of the grain is much reduced. A suggestion is made that reducing the temperature of grain to below the minimum for the weevils might be an effective means of control.

URBAHNS (T. D.). **The Pear Leaf Blister Mite.**—*Mon. Bull. Calif. Dept. Agric.*, xvi, no. 2, pp. 77–80, 1 fig. Sacramento, Cal., February 1927.

The pear leaf blister-mite [*Eriophyes pyri*, Pgst.] has been causing serious injury to pears throughout California. A short account is given of its seasonal history. Under normal weather conditions many of the mites are inactive from December to February, but where infestation is very severe, winter bud injury may occur, so that one or more of the flower organs are killed. Such injury is particularly noticeable in mild weather.

The cluster-bud spray is considered to be the most effective against *E. pyri*, infestations usually occurring where the spring spraying for scab is omitted, and if applied when the cluster buds are wide open and the leaf buds show the tips of the green leaves, it may be relied upon for protection against the mite. The spray should consist of 4 U.S. gals. liquid lime-sulphur or 8–10 lb. dry lime-sulphur in 100 U.S. gals. water. Under very favourable weather conditions greater concentrations may be used, though they sometimes cause injury that results in a russet appearance of the fruit. Spraying when the buds are dormant or just breaking gives only partial control. If autumn spraying is to be done, the sprays must be applied sufficiently early to kill the mites before they enter the buds deeper than the outer layer of bud scales. There are various objections to autumn spraying, such as the difficulty of reaching all the mites, the persistence of the leaves on the trees late in the autumn, and the extra cost of the more concentrated solution, but when the infestation is very severe and there is a danger of bud injury in the case of mild weather, it is worth while applying the autumn spray.

Bureau of Plant Quarantine and Pest Control.—*Mon. Bull. Calif. Dept. Agric.*, xvi, no. 2, pp. 89–93. Sacramento, Cal., February 1927.

In the course of quarantine inspection in California a passenger's luggage was found to contain kamani nuts infested with the larvae of the Mediterranean fruit-fly [*Ceratitis capitata*, Wied.] and a boll of raw cotton infested with the larvae of the pink bollworm [*Platyedra gossypiella*, Saund.]. The box also contained various other seeds amongst which living pupae and adults of *C. capitata* were found. The adults had actually emerged during transit. Avocado seeds from Central America were infested with the larvae of *Stenoma catanifer*, Wlsm., a moth that is a serious pest of avocados in the tropics.

At a meeting of the entomologists of the U.S. Department of Agriculture, University of California and State Department of Agriculture held in February, recommendations for uniform control of codling moth [*Cydia pomonella*, L.] and peach twig borer [*Anarsia lineatella*, Zell.] were agreed upon. In the case of *C. pomonella*, it is most important that the first brood should be controlled; the calyx spray is the most important spray and should be applied when the petals have nearly fallen. When a second calyx spray is necessary, it should be applied before the calyx lobes close. Standard (acid) lead arsenate at the rate of 2–3 lb. of powder or 4–6 lb. of paste to 100 U.S. gals. of water should be used.

The first cover spray should be made before the larvae begin hatching, and if the weather is warm after the trees bloom, it should be completed within 2 weeks after the calyx spray, or in cool weather within 3 weeks. Subsequent sprays should be applied at intervals of about 2 weeks when the fruit is growing rapidly. Late sprays should only be made where infestations are of sufficient importance to warrant further treatment. Burlap bands should be placed round the trunks of the trees about 20th

May and should be examined every 10 days throughout the summer. The usual supplementary measures should be applied in orchards and packing houses, etc.

In many districts in California *A. lineatella* has been increasing and causing heavy losses to peaches, apricots, plums, prunes and almonds. A vigorous campaign by growers is advised. An effective control of the spring brood will materially reduce later attacks on fruit. A delayed dormant lime-sulphur spray applied from the time the blossom buds are beginning to break until the first blossoms open is the standard control and is still recommended for all stone fruits except apricots. Injury resulting from this treatment is due to the use of unreliable materials or to spraying under unfavourable conditions. Under such conditions 6–8 gals. lime-sulphur (23° Bé.) to 100 gals. water should be used instead of 10. This spray is also effective against peach blight and leaf curl. For severe infestations of *A. lineatella*, 3 lb. of dry basic lead arsenate should be added to each 100 U.S. gals. of spray. If Bordeaux mixture is preferred, the 5–5–50 formula should be used with 3 lb. of dry basic lead arsenate to 100 U.S. gals.

For apricots where a combined insecticide and fungicide is desired and lime-sulphur is likely to cause injury, Bordeaux mixture 8–8–50 with 3 lb. of dry basic lead arsenate to every 100 U.S. gals. of spray should be applied at the red bud stage.

Mackie (D. B.). **The Elm Leaf Beetle.**—*Mon. Bull. Calif. Dept. Agric.*, xvi, no. 5, pp. 294–301, 5 figs. Sacramento, Cal., May 1927.

Elms, which are the chief shade trees of California, and which for many years were comparatively free from insect pests, have during recent years been regularly infested by the European elm scale [*Gossyparia spuria*, Mod.], the brown elm scale [*Lecanium canadense*, Ckll.] and the elm leaf beetle [*Galerucella luteola*, Muls.]. The first two attack the twigs and branches and are not noticeable unless present in large numbers, when dead twigs and branches become evident. *G. luteola* defoliates the trees, causing permanent injury. This insect first appeared in Fresno, California, in 1924 and has spread over 30 miles east, 100 miles south and 50 miles north. As cars are parked in the shade of the elms that line the streets, they are during the summer months a serious, and in fact the chief, means of spread of the pest. The adults eat holes in the young leaves in the spring and deposit eggs on the foliage. The larvae feed on the cellular tissues on the lower leaf surface and, when numerous, completely skeletonise the leaves. While in the Eastern United States only two generations at most occur in a season, in California there are four or five. Moreover, the recovery of a tree after defoliation is rendered particularly difficult owing to the long season of insect activity (new growth being immediately attacked by the adults or larvae, which are always present) and owing to the fact that there are no summer rains throughout the greater part of the State. However, in the absence of summer rains, one spraying is sufficient to give protection for an entire season, with two or three where heavy summer rains do occur. The only adequate apparatus for spraying this type of tree is a machine with a solid stream nozzle. The machinery considered suitable and the nozzle and pump capacities necessary to spray trees of various heights are discussed. As a general rule, elm trees require a pressure apparatus sufficient for a ¼ in. or $\frac{5}{16}$ in. orifice nozzle. Some modern sprayers will deliver 75 U.S. gallons a minute under 1,000 lb. pump pressure.

FERRIS (G. F.). **Mealybugs.**—*Mon. Bull. Calif. Dept. Agric.*, xvi, no. 6, pp. 336–342, 1 ref. Sacramento, Cal., June 1927.

This is a general review of the mealybugs that occur in California or that are likely to be introduced into the State. It is pointed out that microscopic examination has revealed synonymy that would not have appeared possible from the original descriptions of the insects concerned. The importance of accurate systematic work and the value of collections for this purpose are discussed, as well as its utility in helping to determine the country of origin of a given species.

BROCK (A. A.). **Citrophilus Mealybug in California.**—*Mon. Bull. Calif. Dept. Agric.*, xvi, no. 6, pp. 342–344. Sacramento, Cal., June 1927.

The citrophilus mealybug, *Pseudococcus gahani*, Green, is one of the most destructive mealybugs in California. It causes serious damage to *Citrus* by covering the leaves with honey dew, on which sooty mould fungus grows ; and it congregates around the buttons of the new fruit and the stems of the older fruit, sometimes causing a considerable percentage to drop. The infested area covers about 47,800 acres at present, but no doubt the infestation will soon spread to the entire citrus-growing area unless every effort is made to prevent it. Neither spraying nor fumigation has proved satisfactory, and biological control is relied upon by all growers. There are 12 commercial insectaries in California, and during 1926, these produced nearly nine million *Cryptolaemus* [*montrouzieri*, Muls.] at a cost of about £20,000. This cost does not include the application of burlap bands, ant poison, etc., which is necessary to facilitate the work of the predators.

TODD (F. E.). **The Argentine Fruit Fly Problem.**—*Mon. Bull. Calif. Dept. Agric.*, xvi, no. 6, pp. 344–350, 4 figs. Sacramento, Cal., June 1927.

In view of the restrictions on the importation of fruit into the United States from Argentina, it is proposed to study the situation in that country. The Trypetids recorded are *Anastrepha fraterculus*, Wied., and possibly *Ceratitis capitata*, Wied. The author discusses his observations during a visit in 1924–25, and points out that fruits from both the infested and uninfested areas of Argentina, Paraguay and Brazil find their way to the Buenos Aires market, where they are prepared for export or local consumption. Even though the fruit areas of southern Argentina might be uninfested, this practice affords a chance for at least an annual reinfestation of the plantings near Buenos Aires and is also a potential menace to other fruit passing through that city. Therefore any view of the problem that considers only the conditions in the producing areas and does not include the mingling of fruits on the Buenos Aires market is incomplete.

PAPERS NOTICED BY TITLE ONLY.

SOLIMAN (L. B.). **A comparative Study of the structural Characters used in the Classification of the Genus *Macrosiphum* of the Family Aphididae, with special Reference to the Species found in California.** —*Univ. Calif. Pub. Ent.*, iv, no. 6, pp. 89–158, 77 figs. Berkeley, Cal., 1927.

LAING (F.). **An interesting Aphid [new species] and a Coccid from the Argentine Republic.**—*Rev. Soc. ent. Argent.*, ii, no. 4, pp. 23–26, 2 figs. Buenos Aires, 1st November 1927.

REYNE (A.). **Untersuchungen über die Mundteile der Thysanopteren.** [Investigations on the Mouth-parts of the Thysanoptera.]—*Zool. Jahrb.*, xlix, pp. 391–500, 5 pls. Jena, 1927. [See *R.A.E.*, A, xv, 64.]

LEEFMANS (S.). **A new *Sexava* Species** [*S. karnyi*] **from the Island Poat (Celebes).**—*Treubia*, ix, no. 4, pp. 411–412, 5 figs. Buitenzorg, 1927. [*Cf. R.A.E.*, A, xvi, 129.]

WIESMANN (R.). **Die beiden Knospenwickler** *Tmetocera* (*Eucosma*) *ocellana*, **F., und** *Olethreutes variegana*, **Hb., als Knospenschädlinge der Apfelbäume im Wallis 1926.** [The two Bud-moths, *Eucosma ocellana*, Schiff., and *Argyroploce variegana*, Hb., as Apple Bud Pests in Valais in 1926.]—*Mitt. schweiz. ent. Ges.*, xiv, no. 1 (15th December 1927), pp. 14–16. Berne, 1928. [See *R.A.E.*, A, xv, 645.]

[ANDREEVA (N. V.). **Андреева (H. B.). The Role of Bees in the Pollination of Cultivated Red Clover in Central Russia.** [*In Russian.*]—*Izv. Shatilovsk. Oblast. sel-khoz. Opuitn. Stantz.* [*Bull. Shatilov Reg. Agric. Expt. Sta.*], ii, no. 4, reprint, 5 pp. Orel, 1927.

[ANDREEVA (N. V.).] **Андреева (H. B.). The Biological Cycle of the Swedish Fly.** [*Oscinella frit*, L.]— [*In Russian.*]—*Izv. Shatilovsk Oblast. sel.-khoz. Opuitn. Stantz.* [*Bull. Shatilov. Reg. Agric. Expt. Sta.*], ii, no. 3, reprint, 13 pp., 1 pl. Orel, 1927. [*R.A.E.*, A, xv, 159.]

BATHELLIER (J.). **Contribution a l'étude systématique et biologique des termites de l'Indo-Chine. Les cultures mycéliennes des termites de l'Indo-Chine.**—*Faune Colon. fr.*, i, pp. 125–365, 13 pls., 113 figs., 109 refs. Paris, 1927.

GRANDI (G.). **Imenotteri sicofili raccolti dal Prof. F. Silvestri nell' Indocina, nella Cina, nella penisola Malacca e a Formosa.** [Fig Insects collected by Prof. F. Silvestri in Indo-China, China, the Malay Peninsula and Formosa.]—*Boll. Lab. Zool. Portici*, xx, pp. 169–188, 8 figs. Portici, 1927.

Lewis (H. C.). **The Vegetable Weevil in California.**—*Mon. Bull. Calif. Dept. Agric.*, xvi, no. 7, pp. 378–392, 13 figs., 29 refs. Sacramento, Cal., July 1927.

The Curculionid, *Listroderes obliquus*, Gyll. (vegetable weevil), was first observed in California in the spring of 1926, although it had probably been present for several years. Its known distribution at the present time is limited to the San Francisco Bay region, but it has apparently become so firmly established that its eradication is improbable. The larvae and possibly some eggs may be carried on the tops of such vegetables as carrots, turnips, spinach and cabbage taken from infested areas between the months of September and the following June. The adults migrate at night from infested fields to adjoining ones and may possibly be carried in hay or manure, in which they hide. They have not been observed in flight, but probably fly a short distance at some time of the year, since the spread of infestation is greater in the direction of the prevailing winds. An infestation covering thirteen acres in 1926 spread to four times that area in a year.

The larvae and adults are polyphagous, the former causing the more serious injury. They usually attack the leaves and stems, though they injure the crowns of carrots severely and tunnel into the roots of turnips and occasionally into those of carrots. The adults feed on the leaves and stems of such plants as potatoes and tomatos, being particularly injurious to young tomato sets in the field. In one instance 6,000 plants were destroyed in two weeks. Adults from larvae feeding on *Conium maculatum* in and around a young pear orchard were found attacking the foliage of the young trees. The adults begin to emerge in April and are active in May and June, feeding at night except where thick foliage affords the required protection from the light, and sheltering during the day under clods, leaves or rubbish. They aestivate in the ground, in rubbish, etc., from the middle of June until the beginning of October. Oviposition then begins and continues throughout the winter, reaching its first peak at the end of October and its second in February, with a period of diminished activity during the cold weather from the middle of December until the end of January. The eggs are deposited on the stems, in the crowns of the food-plants, and on the ground. The first larvae reach maturity by the end of November and leave the tops of the plants to construct pupal cells in the upper two inches of soil. Pupation begins as early as the first part of February and reaches its height about a month later, pupae being found in the soil as late as the end of May. Those larvae reaching maturity in the autumn remain much longer in the prepupal stage than those entering the soil in the spring. Newly hatched larvae continued to appear until the beginning of May. The larvae, which are active chiefly at night, are very resistant to cold and wet weather conditions, partly grown larvae found on cold mornings encased in frozen dew becoming active again during the warmer part of the day. If the cells made by the larvae are destroyed, new ones are constructed before pupation, but the pupae are easily crushed, and thorough cultivation of the soil during the pupal period causes a high mortality. Field observations indicate that there is only one generation a year, with oviposition extending over a long period and considerable over-lapping of the life stages. All stages of the insect are briefly described.

Control measures, tested in cages, and, to a certain extent, in the field, included crop rotation, cultivation, spraying and dusting and the use of poison baits. Vegetables less susceptible to attack should be grown during the seasons when the larvae are most active. Where possible carrots, turnips, spinach, and, to a less extent, beets and radishes, should not be grown in winter on heavily infested land, nor should potatoes or tomatos be planted in spring on land heavily infested during the previous winter. Cultivation is most effective during March and April, when the largest number of pupae are present in the soil, and since the weevils breed on wild plants, weeds should be destroyed in infested areas. A spray of acid lead arsenate, used at the rate of 3 lb. to 100 U.S. gals. water, has given satisfactory results, and basic lead arsenate, although not toxic enough to control the larvae, has been employed with a fair degree of success against the adults. Dusting has been found equally effective. Acid lead arsenate or calcium arsenate gave satisfactory results when used at the rate of 1 lb. to 5 lb. of hydrated lime, gypsum or flour, and caused no scorching. Sulphur as a carrier caused some stunting among carrots. Calcium arsenate without a carrier has been used without ill effects. The use of contact insecticides has not so far proved practical. Experiments have been made with 47 poison baits in the laboratory and with several of the more promising in the field, but the results are not yet conclusive. Fruits were the most satisfactory materials used, vegetable baits being less attractive. Sweet substances, acids and vegetable extracts added but little to the attractiveness of a bait.

SMITH (E. L.). **The Dictyospermum Scale in California.** *Chrysomphalus dictyospermi* (**Morgan**).—*Mon. Bull. Calif. Dept. Agric.*, xvi, no. 7, pp. 404–405, 2 refs. Sacramento, Cal., July 1927.

Surveys made to determine the extent of infestation by *Chrysomphalus dictyospermi*, Morg., in California, showed that the scale was apparently confined to greenhouses and lath shelters. Effective control appears to have been maintained, and in some cases infestations seem to have been eliminated. Additions to the food-plants already given for California [*R.A.E.*, A, iv, 363] are *Ficus elastica*, *Pandanus*, *Dictyospermum* and *Cycas*.

CHAMBERLIN (J. C.). **Status and Synonymy of the Dictyospermum Scale.**—*Mon. Bull. Calif. Dept. Agric.*, xvi, no. 9, pp. 484–491, 6 figs. Sacramento, Cal., September 1927.

Owing to the fact that *Chrysomphalus dictyospermi*, Morg., has recently been found infesting palms out of doors in California, where it has never been known to establish itself in the open before, a further study has been made of this scale, more especially since it is a serious pest of *Citrus* in other regions. The results confirm those of Green that *C. pinnulifer*, Mask., is a species morphologically distinct from *C. dictyospermi*. Both species have been recorded on *Citrus*, but at present only the latter can be regarded as a serious pest. Examination of a considerable range of specimens from various parts of the world indicates that so far as morphological characters are concerned the form in California, Florida and Louisiana is identical with that infesting *Citrus* in the Mediterranean regions. The preferred food-plants seem to vary in different regions ; thus in Florida it is important as a pest of avocados, in California and Ceylon it seems to prefer various palms, and in the Mediterranean regions it is primarily a pest of *Citrus*.

Notes are given on the synonymy, distribution and food-plants of *C. dictyospermi*, *C. pinnulifer* and *C. pinnulifer* var. *diversicolor*, Green, and their distinguishing characters are tabulated and illustrated.

FLEURY (A. C.). **A Serious Pest Threatens.**—*Mon. Bull. Calif. Dept. Agric.*, xvi, no. 5, pp. 291–293, 2 figs. Sacramento, Cal., May 1927.

Until the recent discovery of *Anastrepha ludens*, Lw. (Mexican fruit-fly) infesting grapefruit in Texas [*R.A.E.*, A, xv, 543], it was claimed that this pest could not exist under the climatic conditions that are found further north than Tampico on the Gulf of Mexico, some 300 miles south of the present infestation. This fly is undoubtedly native to Mexico [*R.A.E.*, A, xv, 527], but in parts of that country where the climate is cool at certain seasons it appears sporadically, apparently being able to hibernate in the pupal stage. This power of adaptation would easily make it possible for it to exist under California conditions. Infestation by *A. ludens* is not revealed by any outward sign until the fruit has broken down, so that it is practically impossible to determine its presence in a citrus fruit unless it is cut open. The importance of a quarantine, which has since been enacted [*R.A.E.*, A, xv, 668], is discussed, and a short description of the insect and its bionomics is given.

CRAWFORD (D. L.). **Investigation of Mexican Fruit Fly** (*Anastrepha ludens* **Loew) in Mexico.**—*Mon. Bull. Calif. Dept. Agric.*, xvi, no. 8, pp. 422–445. Sacramento, Cal., August 1927.

This investigation was made in Mexico during 1913–14, though the results have not previously been published. The history and the distribution of *Anastrepha ludens*, Lw. (Mexican fruit-fly) in Mexico are discussed ; its range extends into northern South America, but it is not present in the northern and more arid regions of Mexico, being a decidedly tropical insect and requiring a considerable degree of humidity and a temperature not much over 100° F. The food-plants [*R.A.E.*, A, xv, 668] are discussed ; probably owing to the thick rind as well as the thick rag within, grapefruit seems to be preferred, other fruits seldom being attacked in localities where it is ripening. It has not yet been ascertained whether by the elimination of food-plants the fly would be driven to attack other fruits, but larvae taken from grapefruit and placed in a lemon lived in it for some weeks and later emerged as adults, indicating that the larvae can live and thrive in this fruit, although flies have never been seen to rest on lemon trees, nor have larvae been found in the fruit.

The life-cycle of *A. ludens* apparently occupies about 3 months ; the eggs are deposited singly, or in small groups, just beneath the cuticle of the fruit, 9 to 12 days after the emergence of the adult. The average number deposited by one female is probably from 50 to 70. The eggs hatch in about 4 days, but may not do so for a month if deposited in green fruit. The larval period normally lasts about 6 weeks, but this stage may also be prolonged in green fruit, or shortened through lack of food. The pupal stage lasts from 20 to 25 days in summer and 25 to 30 days in winter ; the pupae occur in the soil at a depth of from $\frac{1}{4}$ to 2 ins. below the surface or on the floor or in the bottom of a box in the packing house. The atmosphere in the tropics is sufficiently moist to prevent the pupae from drying out, but in a dry climate such as southern California they would probably perish. Heat is very injurious to the fly, which avoids direct sunshine in the hot part of the day, and larvae have been found dead in fruit that has lain in the sun when the temperature of the ground was about 140° F. In the east coast region of Mexico there is one generation of *A. ludens* in March and April, another in July, and a third, the adults of which mature in two batches, the first in September and October and the second, resulting from oviposition in green *Citrus* fruit, in November; the first batch is of little importance, but the second gives rise to the first generation of the following year. *A. ludens* is able to maintain itself throughout the year on *Citrus*, the gap between the crops being filled in by off-season and green fruit. It is distributed by transport of infested fruit; the adults fly very little and are seldom carried by the wind.

The fly is controlled to a great extent by natural agencies, high temperature and lack of humidity being of great importance, and in some regions the percentage of the crop affected is never more than from 1 to 5 per cent. A Braconid, *Diachasma crawfordi*, Keilin & Picado, usually recorded in Mexico as *Cratospila ridibunda*, Say [*cf. R.A.E.*, A, xv, 527], has been recorded as a parasite of *A. ludens*, but has not been found in the Gulf region, and a large ant is predacious on the larvae, while one of the puparia was found to be completely filled with the spores of a fungus. Birds also act as an important control, and poultry should be turned into orchards to feed on the larvae and pupae.

The presence of maggots in the fruit can only be detected when they have reached a considerable size. The first external evidence of their presence can be seen the first or second week after hatching, and takes the form of a slight discolouration or deepening of the colour in a small part of the rind or skin of the fruit; this becomes more and more distinct until the fruit is loosened from the stem and will drop off at a touch; another external sign is a softening of the fruit indicating the spots under which the larvae are burrowing. This injury is less marked in *Citrus* than in other fruits; the former generally bear one or more small holes in the rind through which the juice drips. Under some conditions internal evidences are more easily seen than external ones; the larvae burrowing in the rind for several weeks leave brown criss-cross galleries throughout part of the rind, and if the fruit is cut through transversely sections of infested oranges or grapefruits will be found to be abnormal. It has been determined that the first larvae emerge from fallen fruit in 4 days, so that the fruit should be picked up twice a week. This, however, is impracticable in large orchards, and since a large percentage emerge in from 7 to 12 days, weekly collection of the fallen fruit is of value. All fruit thus collected should be buried or burned, and not given to pigs, since the larvae may pass through them alive.

A bait-spray of 1 lb. lead arsenate, 6 lb. brown sugar and 20 U.S. gals. water is recommended, as from 8 to 12 days intervene between the emergence of the adults and oviposition; during this period, the flies feed on any available sweet substances. It should be applied every 2 or 3 weeks in fine weather, but should be renewed at least every 10 days in wet weather. Applications should be made from late September to late December and will sometimes also be advisable in July. Mention is also made of the use of a decoction of a native plant, *Haplophyton cimicidum*, as an insecticide in bait-sprays [*R.A.E.*

A, iii, 37]. Grapefruit trees may be used as trap crops in a mixed orchard. Fumigation of fruit in an air-tight chamber for 48–72 hours with hydrocyanic acid gas, using 6 oz. potassium cyanide to 100 cu. ft. space, killed most of the larvae without affecting the fruit. Fruit placed in a steam heater at a temperature of 110° F. for a few hours contained no living larvae on being opened several days later; the fruit is not injured by this treatment, provided that it is cooled.

Another Trypetid, *Anastrepha fraterculus*, Wied., has been reared from guavas and mangos in Mexico and may be the cause of some of the damage attributed to *A. ludens*.

WILSON (G.) & LEWIS (H. C.). **The European Earwig and its Control.** —*Mon. Bull. Calif. Dept. Agric.*, xvi, no. 8, pp. 468–471. Sacramento, Cal., August 1927.

The distribution and bionomics of *Forficula auricularia*, L. [*R.A.E.*, A, xvi, 105] are discussed by the senior author. The infestation covers a limited area in the San Francisco Bay region, where this earwig is chiefly a household pest, and the infestation has spread far more slowly than in other regions.

The application of poison bran baits is discussed by the junior author; a bait which is particularly attractive to the adults consists of 5 lb. wheat, 2½ lb. meat meal, 2½ lb. sugar and 10 oz. Paris green. It may be applied throughout the summer and autumn, two applications being made at intervals of 20 to 30 days, preferably on a warm dry afternoon after four o'clock; about 5 lb. of bait is sufficient for an area of about 40 by 100 ft.

URBAHNS (T. D.). **Commercial Insecticides and some of their Uses.**—*Mon. Bull. Calif. Dept. Agric.*, xvi, no. 10, pp. 525–530. Sacramento, Cal., October 1927.

In view of the increasing use of commercial insecticides that has accompanied the growth of the fruit industry in California, a classified description is given of the chief compounds now sold for orchard spraying. Commercial insecticides in California are carefully supervised by the Division of Chemistry of the State Department of Agriculture, being registered, inspected and chemically analysed, whereas home-made preparations rarely receive chemical tests. The injury that may be caused under certain circumstances by some of these insecticides is discussed.

SNYDER (T. E.). U.S. Bur. Ent. **Termites modify Building Codes.**—*Mon. Bull. Calif. Dept. Agric.*, xvi, no. 10, pp. 531–536, 8 figs. Sacramento, Cal., October 1927.

Most of the information contained in this paper on the injury caused to buildings by termites in the United States has already been noticed [*R.A.E.*, A, xiii, 277; xv, 287, 437]. In addition to native termites, *Coptotermes formosanus*, Shiraki, which has recently been introduced from Formosa into Hawaii, where it is spreading rapidly, is likely to be imported into California, and the strictest measures have been taken to prevent its introduction.

Bureau of Plant Quarantine and Pest Control.—*Mon. Bull. Calif. Dept. Agric.*, xvi, no. 10, pp. 540–543. Sacramento, Cal., October 1927.

In commenting upon the necessity for complete quarantine action, H. Atherton Lee gave an account of the measures adopted in Hawaii in the case of sugar-cane, which include a three-year holding under quarantine isolation before the introduction of new varieties of cane.

The occurrence of *Caulophilus latinasus*, Say (broad-nosed grain weevil) in California is recorded by A. A. Brock. This weevil has been found in avocado seeds in Florida, Central America, Mexico and the West Indies, and also attacks other seeds, particularly maize. Weevils infesting the roots of strawberry plants in north-eastern California include: *Otiorrhyncus* (*Brachyrrhinus*) *rugifrons*, Gyll., *O.* (*B.*) *sulcatus*, F., and *O.* (*B.*) *ovatus*, L.

The nursery service report by E. L. Smith indicates that *O. sulcatus* has been completely eradicated from greenhouses by keeping out the migrant beetles by means of shallow troughs containing crude oil, and by destroying those already in the greenhouses by hand picking and spraying with lead arsenate.

Cook (W. C.). **Some Effects of Alternating Temperatures on the Growth and Metabolism of Cutworm Larvae.**—*J. Econ. Ent.*, xx, no. 6, pp. 769–782, 7 figs., 7 refs. Geneva, N.Y., December 1927.

The following is the author's summary of this paper: Two sets of experiments are presented, which were planned to determine the effects on growth and metabolism of alternating high and low temperatures. One set gives the rate of growth of first instar larvae of *Porosagrotis orthogonia*, Morr., when exposed to various high temperatures for short periods daily, and the other set gives the rate of carbon dioxide production by nearly mature larvae of *Chorizagrotis auxiliaris*, Grt., during similar exposures.

Both experiments point to the same conclusion: In working with temperature it is necessary to consider the time of exposure. They show that larvae removed from a cold room to a warm incubator gradually accelerate their metabolism for several hours, after which their metabolic rate gradually declines over two or three days to a lower constant figure. The combinations of time and temperature that produced most rapid metabolism in the cutworms used were those that are very common in the temperate zone during the growing season.

These results are interpreted as being the resultants of opposing forces. In considering the relation of temperature to metabolism, the two forces concerned may conceivably be the increased activity and increased destruction of enzymes at high temperatures. In considering the relation of time to metabolism, the two forces might be the production of new tissue material and the elimination of waste products. In both cases an equilibrium is reached.

A combination of the time-temperature-metabolism curves gives a three dimension surface, from which the rate of metabolism or growth for any time-temperature combination may be predicted. This surface has the following properties: An optimum combination of time and temperature for the given species, at which the rate of growth reaches its highest absolute value; a shift in time position of the optimum line with changes in temperature, the optimum time being shortened at higher temperatures ; a series of zones of equal growth rate, surrounding the absolute time-temperature optimum (this makes it possible to secure any given growth rate less than the maximum by several combinations of time and temperature) ; and a correlation of the limits of growth in time and temperature with the zones of dormancy and the thermal death points.

SWEETMAN (H. L.). **A Preliminary Report on the Factors controlling the Oviposition of May Beetles in Minnesota** (*Phyllophaga*, **Scarabaeidae, Coleoptera**).—*J. Econ. Ent.*, xx, no. 6, pp. 783–794, 2 figs., 14 refs. Geneva, N.Y., December 1927.

In consequence of severe outbreaks of white grubs, *Lachnosterna* (*Phyllophaga*) spp., in several areas in southern Minnesota in 1924–25, a survey was made in 1925 of a territory that had been subject to infestation for several years to determine the influence of local factors and to correlate this with the known facts regarding oviposition. A review of the literature on these beetles is given. In Minnesota the beetles emerge in the spring and oviposit in the soil. The eggs hatch in 2 to 4 weeks, and the larvae feed upon the roots of the vegetation for 2 to 4 years before pupating in the soil at a depth varying from a few inches to 2 ft. The adult stage is reached in the same year, but the beetles remain in the pupal cells until the following spring. The species studied included : *Lachnosterna* (*Phyllophaga*) *fusca*, Froel., *L. implicita*, Horn, *L. rugosa*, L., *L. anxia*, Lec., *L. futilis*, Lec., *L. nitida*, Lec., and *L. drakei*, Kirby. Assuming that a 3-year life-cycle occurs in Minnesota, damage observed in 1925 was probably caused by the larvae from eggs laid in 1923. The crop history in 1923 of fields showing infestation in 1925 revealed 100 per cent. infestation in barley. As maize, oats, clover, and clover mixed with timothy also contained a considerable percentage of larvae, it was concluded that selection by ovipositing females is not an important factor. No infestation was observed in blue-grass. While two-thirds of the fields within ⅛ mile of trees were attacked, and 117 out of 167 non-infested fields were at a greater distance from trees, rather more than 50 per cent. of fields without trees showed infestation. As the flight of the beetles is not believed to exceed ⅛ mile, it is assumed that plants other than trees are used for food by the adults. *L. anxia* was observed in 1926 to feed on herbaceous as well as on woody plants, though the latter were preferred.

Oviposition studies carried out in 1926, which confirmed the results of the preceding survey, showed that the beetles do not select places for oviposition according to vegetation, but fly at random from the food-plants. As the adults follow the direction of the wind when returning to the fields in the morning, this factor is of some importance, though it does not apparently influence the evening flights. Oviposition occurs in the immediate vicinity of food-plants, regardless of the elevation or type of soil, when the physical conditions are suitable. Lucerne, which has been previously described as unfavourable to oviposition, was found to be infested in soil low and moist enough to harbour the larvae. The eggs are laid wherever the soil is soft enough to permit digging and sufficient moisture is present. Oviposition can be delayed at least 5 days when the beetles happen to find themselves in unfavourable places. It is probable that many eggs and young larvae perish where oviposition has taken place in very dry soils. Cultivated land, as found in maize fields, supplied suitable conditions for oviposition in 1926, while the physical conditions in fields of small grains and grass-land proved unfavourable. Infestation was hindered in some cases by the dry spring, which rendered the soil in uncultivated plots hard to penetrate, and the type of vegetation is also a factor in deterring the beetles. *Agrostis stolonifera* (bent grass) was thus found to prevent *L. fusca* from burrowing in a golf green on account of its thick matted roots.

Fink (D. E.). U.S. Bur. Ent. **Is Glutathione the Arsenic Receptor in Insects ?**—*J. Econ. Ent.*, xx, no. 6, pp. 794–801, 2 figs., 7 refs. Geneva, N.Y., December 1927.

The following is the author's abstract : This paper deals with the quantitative estimation of glutathione in normal insects and those after treatment [feeding or injection] with arsenicals of varying dilutions. Preliminary results indicate a variation in the normal glutathione content in different species. Those species subjected to arsenical treatment exhibited a marked reduction in their glutathione content, presumably indicating that glutathione is an arsenical receptor.

[Glutathione is defined as a dipeptide composed of glutamic acid and cystein.]

Lipp (J. W.). U.S. Bur. Ent. **An Improved Carbon Bisulphide Emulsion for the Control of Larvae of the Japanese Beetle and other Insects.**—*J. Econ. Ent.*, xx, no. 6, pp. 801–805, 1 pl., 6 refs. Geneva, N.Y., December 1927.

As the result of experiments carried out in New Jersey, a new formula [*R.A.E.*, A, xv, 607] has been used to prepare carbon bisulphide emulsion for the control of the larvae of the Japanese beetle [*Popillia japonica*, Newm.]. This emulsion, while preserving the desirable features of the one previously in use [*R.A.E.*, A, xiii, 381], is less liable to stratify or break, thus eliminating the necessity of shaking the container to render its contents homogeneous. The powdered resin is mixed gradually with the previously warmed sodium hydroxide solution, to which are added, first the water which is previously heated and subsequently stirred until the resin has dissolved, and then the oleic acid. Good results have also been secured against the larvae of *Anomala orientalis*, Waterh. (Asiatic beetle) and of *Cotinis nitida*, L. (green June beetle) with this emulsion.

Childs (L.). **Two Species of Thrips injurious to Apples in the Pacific Northwest.**—*J. Econ. Ent.*, xx, no. 6, pp. 805–808, 1 pl., 1 ref. Geneva, N.Y., December 1927.

Injury to apples known as pansy spot, caused by the oviposition punctures of *Frankliniella occidentalis*, Perg., and *Aeolothrips fasciatus*, L., occurred in several apple-growing districts in the Pacific Northwest in 1926, the grade of the fruit being lowered by 20 per cent. in some instances in Oregon. The life-history of these thrips in the orchard is little known. The information given concerning the habits of of *F. occidentalis* and the nature of the injury caused has already been noticed [*R.A.E.*, A, xiv, 173]. Oviposition probably begins during blossom time, though it was first observed in Oregon after the flower parts had dropped, and it continues until the fruit is 1 or 1½ inches in diameter. In May 1926, *A. fasciatus* was observed depositing eggs in the midribs of apple leaves, apparently more extensively than in the fruit. This species, which is possibly predacious, appears to be more numerous than *F. occidentalis*, though this may be due to the migration of the latter to other food-plants to complete its growth. The choice and management of cover crops may prove to be a factor in controlling the thrips, and thorough disking and ploughing before the blossom appears is recommended as a possible means of destroying overwintering insects. In the course of spraying tests carried out in 1924 and 1925, it was found that a 3 per cent. proprietary oil spray containing 1 pint 40 per cent. nicotine sulphate to 100 gals., applied when the trees were in full bloom and again as soon as the petals fell, reduced injury by more than 50 per cent., though complete control was not secured. Many of the petals turned brown soon after the spray was applied, but a good crop of fruit was set. The application of oil alone was not effective.

HERVEY (G. E. R.). **A European Nitidulid,** *Brachypterolus pulicarius*, **L. (Coleoptera, family Nitidulidae).**—*J. Econ. Ent.*, xx, no. 6, pp. 809–814, 1 fig. Geneva, N.Y., December 1927.

The Nitidulid, *Brachypterolus pulicarius*, L., probably recently introduced into the United States from Europe, was observed in May 1924 on strawberry plants in New York State. Though the adults feed in the blossoms of a variety of plants including strawberry, to which they have been stated to be injurious [*R.A.E.*, A, x, 534], observations carried out in 1925 showed that damage to the latter plant was in most cases so slight as to be hardly noticeable. From an examination of the literature it appears that malformed berries attributed to the activities of *B. pulicarius* are probably due to injury to the pistils by frost or some other agency. In the United States the beetle apparently breeds only on *Linaria vulgaris* (common toad-flax). In 1925 the adults were first observed on 6th May, when they were already numerous on strawberry, to which they were entirely confined until 15th May. After this, they migrated to a variety of plants, but occurred only on *L. vulgaris* by the time mating was observed on 27th June. The first eggs, which are laid on the unopened blossom of *L. vulgaris*, were found on 20th July; the larvae, which feed on the ovary of the blossom, were already numerous on 23rd July; and the first pupa was discovered on 7th August buried about 2 inches in the soil. Both larvae and pupae were present during August and most of September, during which month adults were numerous on the blossoms. There is apparently only one generation a year. A description of all stages of the beetle is given.

BOYCE (A. M.). **A Study of the Biology of the Parsley Stalk Weevil,** *Listronotus latiusculus*, **Boheman, Coleoptera: Curculionidae.**—*J. Econ. Ent.*, xx, no. 6, pp. 814–821, 1 pl., 1 fig. Geneva, N.Y., December 1927.

Listronotus latiusculus, Boh. (parsley stalk weevil) has caused serious injury to carrots on Long Island during the past few years, losses amounting to 75 per cent. of the early crop being reported, though the later crop is practically free from damage. The history and distribution of the weevil in the United States are discussed and a description of all its stages is given. Studies were carried out in 1926 with larvae taken from the roots of carrot, curled-leaved parsley, *Apium petroselinum* (Hamburg parsley), *Anethum graveolens* (dill) and wild carrot, which grows along roadsides and may constitute a potential source of infestation. Three generations occurred with considerable overlapping, breeding being apparently continuous throughout the season. The injury is caused by the larvae of the first and second generations, the adults of the latter beginning to emerge about 16th August, by which date the early carrot crop is harvested. First generation larvae began to hatch about 2nd June, and the maximum emergence of adults was reached about 22nd July. The females of the first generation began oviposition on 17th July, and the maximum emergence of the second generation occurred about 15th September. Oviposition for the third generation began on 6th September and the first adults appeared on 9th October.

From 3 to 8 eggs are laid in cavities in the stalks hollowed out by the females, 80 per cent. of those observed being on the concave side of the stem, and as many as 8 egg-pockets being found on a single plant. Oviposition was first observed on 21st May, when the plants were about three inches high. The average incubation period was 12 days for the first generation and 8 days for the second. When the egg cavity is situated one or two inches above the base of the stalk, the larvae tunnel downward and enter the carrot at the side of the crown, but where the cavities are relatively high up the stalk, they make an exit hole after tunnelling for an inch or two upward or downward and enter the carrot through the soil after crawling or dropping to the ground. Feeding in the carrot occurs in the upper half and in the outer portion of the root, the heart being rarely attacked. After about 14 days, the larva leaves the carrot and pupates in the soil about two inches from its exit. The pre-pupal stage lasts from 1 to 5 days, and the pupal stage 6 to 12. The weevils migrate to the surface of the soil one or two days after reaching the adult stage and feed on the epidermis of the stalk. There are indications that they pass the winter in the adult stage in the area where the food-plant has been grown, just below the surface of the soil, though this has not been definitely established.

Effective control of *L. latiusculus* can be secured by means of crop rotation, and the development of first generation larvae might possibly be checked by late thinning of plants containing egg cavities and immature stages.

KING (K. M.) & ATKINSON (N. J.). **Quantitative Methods of collecting and rearing Soil Cutworms.**—*J. Econ. Ent.*, xx, no. 6, pp. 821–830, 3 refs. Geneva, N.Y., December 1927.

This paper describes in detail methods of collecting and rearing soil-infesting cutworms found suitable under Saskatchewan conditions for securing accurate estimates of the relative abundance of the species involved, and the abundance and effectiveness of their various parasites and diseases. In selecting fields for collections the following factors should be taken into consideration : topography, the soil and its state of cultivation, the vegetation, and the known or probable proximity of moth food at the time of major flight of the various species during the preceding year. Valuable results are secured by selecting for successive collections several fields differing somewhat in environmental factors. To secure a representative collection cutworms should be taken from a number of different plots in the field under study. The plots may be selected at definite intervals or according to important environmental factors. Each larva must be kept isolated from all others from the moment of collection until maturity and must be reared with such precautions as will minimise the subsequent effects of changed conditions or the possibilities of cross infection. Fifty larvae of a single species in each collection are sufficient to show the total rates of mortality from disease or from combined parasitism with considerable accuracy, a relatively correct estimate of the prevalence of various parasite species being secured by averaging the results from several successive collections. These collections are started as soon as young larvae can be found and continued at brief intervals as long as the larvae occur. Otherwise, such parasites or diseases as attack either the early or late larvae alone will be overlooked. Where various species are present, a collection of a hundred or more larvae may be made, to be subdivided when greater maturity renders identification easier.

The larvae are reared in the laboratory in the tins in which they are taken in the field, each half-filled with sifted sandy loam and kept at the optimum moisture, the temperature being maintained between 60° and 75° F. They are fed on white Dutch clover, on which parasites are seldom introduced, cut up when dry to minimise the possibility of disease transmission. The date of emergence can be calculated by keeping records of the date of pupation, gauze-covered lamp glasses being placed over the tins when emergence is imminent. The determinations are checked as the moths emerge before removing the glass. Dissections of larvae taken in the field, though a valuable supplement to rearing, do not permit the recognition of early stages of disease or of the outcome of superparasitism.

In practical tests with *Euxoa ochrogaster*, Gn., in which these methods were applied, the rate of parasitism throughout the season was accurately reflected and confirmed by examination of the field from which the cutworms were collected. While the cumulative mortality from parasitism was more than 98 per cent. in one collection, larval mortality in a collection from another field was only 6 per cent., exclusive of parasites, although the larval life in the laboratory averaged 37 days, showing that no material mortality resulted from artificial conditions or cross infection in the laboratory from other collections in which disease was prevalent.

The danger of cannibalism, which is a strong trait in some species, such as *Porosagrotis orthogonia*, Morr., was demonstrated by the confinement together of two collections of larvae, in which the mortality, exclusive of parasitism, was 36 per cent., while in another collection from the same field, in which the larvae were kept separate, the corresponding rate of mortality was only 2 per cent.

PRELL (H.). **On a hibernating Cage for Insects.**—*J. Econ. Ent.*, xx, no. 6, pp. 830–834, 1 fig. Geneva, N.Y., December 1927.

Attempts to keep the hibernating pupae of Tachinid parasites in an environment superficially resembling natural conditions by placing them in soil or moss, which is periodically moistened, or by burying them out of doors, very often prove unsuccessful. This appears to be due to the fact that in nature the pupae lie in cells, whereas under artificial conditions they are in direct contact with the surrounding soil, etc., and are therefore much more liable to be affected by dryness or moisture and by the development of bacteria or moulds. To avoid this difficulty a cage has been constructed consisting of a cylindrical watertight container, 5–6 inches in diameter, partly filled with water and covered by a wire screen in a zinc frame on which the hibernating pupae are placed. This sieve forms at the same time the removable base of an upper part, which is a cylindrical body fitting tightly on to the container or lower part, and closed by a detachable wire screen cover. The evaporation of the water affords a permanently and consistently moist atmosphere, without necessitating direct contact of the puparia with the water, and a permanent free circulation of air is secured by means of the two sieves, the air current being regulated by varying the mesh or covering the upper screen. The cage needs little attention beyond filling up the water container, and it can be easily cleaned and disinfected.

In this cage, Lepidoptera and Hymenoptera hibernated without loss, and even Tachinid puparia gave nearly 100 per cent. emerging flies. A glass vial fixed in a short tube in the wall of the upper part of the cage will catch emerging parasites, and where it is required to keep different species separate, the pupae can be placed in short glass tubes closed with gauze at either end and placed vertically on the sieve.

Common Names of Insects approved for use by American Association of Economic Entomologists.—*J. Econ. Ent.*, xx, no. 6, pp. 837–839. Geneva, N.Y., December 1927.

This list, which is the second supplement to one previously published [*cf. R.A.E.*, A, xiii, 429; xv, 2], contains 56 additional names.

Hamlin (J. C.) & Reed (W. D.). *Vitula serratilineella* **Ragonot on Dried Fruit in California.**—*J. Econ. Ent.*, xx, no. 6, p. 840, 1 ref. Geneva, N.Y., December 1927.

The Pyralid, *Vitula serratilineella*, Rag., has occurred in small numbers in various kinds of dried fruits in California during the past three years. Life-history studies were made from the eggs of a single female, which were laid on raisins at the end of March. They hatched in about 10 days, the larval stage averaging 69 days and the pupal period lasting from 8 to 12 days. The adults emerged between 11th June and 1st July, and after a preoviposition period of from 1 to 10 days, each of 10 females laid on an average 102 eggs, which in June and July hatched in from 4 to 6 days. Adults of the second generation began to emerge on 2nd September. There are thus three generations a year, hibernation occurring in the larval stage. The evidence of the rearings suggests that the scarcity of the moth in southern California is perhaps accounted for by the small number of eggs deposited, and the high mortality of eggs and larvae.

Folsom (J. W.). U.S. Bur. Ent. **Calcium Arsenate as a Cause of Aphis Infestation.**—*J. Econ. Ent.*, xx, no. 6, pp. 840–843. Geneva, N.Y., December 1927.

In dusting with calcium arsenate for the control of the cotton boll weevil [*Anthonomus grandis*, Boh.] in Louisiana, it has been observed that excessive applications of this dust were often followed by heavy infestations of *Aphis gossypii*, Glov. Experiments to discover the cause of this showed that the initial infestations were due to phototropic reaction of the winged female to a white dust, infestation being induced not only with calcium arsenate, but also with calcium carbonate, starch or flour. Plants dusted with calcium arsenate coloured green remained uninfested. The fact that infestation becomes more intense on small areas of dusted cotton than on large ones is accounted for by the lack of opportunity for selection afforded to the Aphids in the latter case. The tests showed that a heavy infestation is subsequently built up by the killing of Hymenopterous parasites, such as *Lysiphlebus* (*Aphidius*) *testaceipes*, Cress., and *Pachyneuron siphonophorae*, Ashm., when they emerge in the presence of the arsenical; calcium carbonate, calcium hydroxide and corn starch having a similar though slower effect. None of the predators that attack the Aphid were killed by dusting [*cf. R.A.E.*, A, xv, 591].

SMITH (F. F.). *Pseudococcus maritimus*, **Ehrhorn, a Pest of Gladiolus and Calla.**—*J. Econ. Ent.*, xx, no. 6, pp. 843–844. Geneva, N.Y., December 1927.

Corms of *Gladiolus* and *Calla* examined after winter storage in Pennsylvania in late May 1925 were found to be severely infested with *Pseudococcus maritimus*, Ehrh., and a slighter infestation was discovered in stored *Gladiolus* stock in July 1927. Tests carried out in 1925 with infested *Gladiolus* showed no living insects and no eggs hatched four days after a ten minutes exposure to hot water at 51–52° C. [123·8–125·6° F.], similar results being secured with immersion in a 5 per cent. emulsion of kerosene and nicotine oleate, the water being at a temperature of 20° C. [68° F.]. These results are not conclusive as the plants had been so badly infested that they all died soon after planting.

TODD (F. E.). **Keeping Quality of Prepared Grasshopper Baits.**—*J. Econ. Ent.*, xx, no. 6, pp. 844–845. Geneva, N.Y., December 1927.

Results equal to those obtained with freshly mixed material were secured in California in 1927 against *Melanoplus devastator*, Scud., with bait prepared according to the formula advocated by D. B. Mackie [*R.A.E.*, A, viii, 386], which had been stored in sealed tins for eight years, the mash being prepared at greater than the recommended strength.

MILLER (R. L.) & THOMPSON (W. L.). **Life Histories of Lady-beetle Predators of the Citrus Aphid.**—*Florida Ent.*, x, nos. 3 & 4, pp. 40–46, 57–59; xi, no. 1, pp. 1–8, 10 figs. Gainesville, Fla., September 1926, January & April 1927.

An account is given of the commoner Coccinellids predacious on the citrus aphis [*Aphis pomi*, DeG.] with descriptions of the stages. *Leis* sp. (Chinese lady-beetle) feeds on various Aphids, the length of life in Florida being unknown. In warm weather from 100 to 200 individuals of *A. pomi* are eaten in a day, but in cool weather the amount is decreased to few or none. On cool days the younger Coccinellids eat more than the older ones, which remain inactive.

During the winter the adults are more or less inactive, gathering in masses in curled leaves, though there are always a few that are active, temperature having considerable influence during the dormant period. The length of time between emergence and pairing is not known, but fertile eggs were observed one week after the beetles became active. Eggs were deposited in masses of 1 to 60, an average total number being 904 deposited at the rate of 85 a day. It sometimes takes several hours for a whole mass of eggs to hatch, in which case the young larvae will probably devour the unhatched ones. The larvae begin to eat Aphids immediately after hatching. The larval period varies according to the time of year and the temperature, in November and December it lasted from 13 to 37 days at temperatures from 59 to 72° F. For pupation, the larvae attach themselves head down to a mature leaf, the pupal stage lasting from 5 to 7 days in warm weather and from 10 to 15 days in cool weather. *Cycloneda sanguinea immaculata*, F., also attacks several species of Aphids. The eggs are generally laid on a large leaf near an Aphid colony, and the larvae hatch in 4 or 5 days and destroy about 16 Aphids a day. The life-cycle, which varies with the season and temperature, occupies about 32 days in spring. This is the most abundant of all the predators and occurs throughout the year. As many as 5 larvae to 1,000 Aphids have been found, but the numbers are limited by the Chalcid parasites, *Tetrastichus blepyri*, Ashm., and *Homalotylus terminalis*, Say, which sometimes destroy as many as 50 per cent. of the larvae ; these are active in the spring and early summer, and during the rainy season a fungus, *Cladosporium* sp., and a bacterial disease kill many of the Coccinellids. *Hippodamia convergens*, Guér., is generally associated with Aphids on vegetable crops. Parasitism of this Coccinellid is not very serious, but at certain times of the year numbers are killed by a bacterial disease. The life-cycle occupies about 30 days in April and May. The eggs are usually laid in clusters on the lower surface of leaves near Aphid colonies ; the larvae begin to feed immediately upon hatching and devour an average of 58 Aphids in a day. The adults are strong, active fliers and fly from vegetable areas to groves in the vicinity. An open, sunny grove or nursery heavily infested with Aphids is a preferred habitat, but apparently vegetable Aphids are the favourite food. *Olla abdominalis sobrina*, Csy., feeds on several species of Aphids and attacks *A. pomi* from March to November, reaching its highest numbers about mid-May. No parasites have been reared from this Coccinellid, but a fungous disease kills large numbers. *Exochomus marginipennis childreni*, Muls., is found at the time when Aphids are most abundant, but is never sufficiently numerous to be of importance. *Chilocorus bivulnerus*, Muls., is primarily a predator on Coccids and only attacks Aphids when adjacent to these. *Novius* (*Rodolia*) *cardinalis*, Muls., is also predacious on Coccids ; it has been observed to eat Aphids, but a complete generation has not been reared on them. *Microweisea coccidivora*, Ashm., and *Ceratomegilla fuscilabris*, Muls., are very occasionally known to attack Aphids.

HAYWOOD (J. K.). **Reports of the Insecticide and Fungicide Board [for the Years 1924-26 and 1926-27].**—6 pp. & 8 pp. Washington, D.C., U.S. Dept. Agric., August 1926 & June 1927.

The activities of the Board from 30th June 1924 until 30th June 1927 are reviewed, after which date its work was transferred to the

Food, Drug and Insecticide Administration. The work has been continued on the same lines as in previous years [*R.A.E.*, A, xiii, 239; xii, 168, etc.].

The fact that paradichlorobenzene is an effective remedy against clothes moths has led to the assumption that it would be an effective repellent against all household insects when simply sprinkled about a room, whereas extensive tests have shown that while this substance and naphthalene are effective as fumigants if the proper quantity is used in a container that can be made practically air-tight, they are not reliable as repellents.

MARLATT (C. L.). **Report [1926-27] of the Federal Horticultural Board.**—36 pp. Washington, D.C., U.S. Dept. Agric., 1927.

The activities of the Federal Horticultural Board during the year, and the legislation enacted with regard to plant quarantines, etc., are reviewed. The chief feature of the situation with regard to the pink bollworm [*Platyedra gossypiella*, Saund.] is its westward extension into New Mexico and Arizona. These places are being isolated for eradication measures, and quarantine has been extended to the areas involved. It is suggested that the movement of labourers with personal baggage such as mattresses stuffed with seed cotton, either by motor or otherwise, should be more strictly supervised. It is estimated that eradication of this pest has been secured over large areas in Texas and Louisiana at an expenditure of less than 0·02 per cent. of the value of the crop for the period involved. The thurberia weevil [*Anthonomus grandis thurberiae*, Pierce] is now considered one of the most serious pests of cotton in Arizona, and the quarantine measures against it have been extended [*R.A.E.*, A, xv, 631]. Scouting for this pest and for *P. gossypiella* can be carried out simultaneously in the autumn and early winter. Vacuum fumigation is to be used against the weevil.

On *Narcissus*, the lesser bulb fly [*Eumerus strigatus*, Fall.] is of widespread occurrence, while the greater bulb fly [*Merodon equestris*, F.] is limited to certain localities; to guard against the spread of these pests, interstate movement of *Narcissus* is made conditional on certification of the bulbs after two inspections, the first in the field during blossoming and the second of the bulbs in storage.

There is now hope of eradicating the date scale [*Parlatoria blanchardi*, Targ.] by heat treatment. The offshoots of the date palm are kept in a room at a temperature of 185° F. until the interior of the buds reaches 128° and the leading bud is killed. It is thought that the quarantine may be removed from palms so treated. Another troublesome scale on the date palm is *Phoenicococcus marlatti*, Ckll.; this, however, is less injurious and is being kept under control by spraying.

The situation regarding the Mexican fruit worm, *Anastrepha ludens*, Lw. [*R.A.E.*, A, xv, 543; xvi, 259] in Texas is discussed; the infestations are local and are confined as yet to grapefruit and sour oranges. Quarantine and other regulations restrict the movement of susceptible fruits from the infested area and provide for eradication measures within them [*R.A.E.*, A, xv, 668]. It is believed that by maintaining these restrictions it will be possible to export fruit safely from the regulated area from October to February, under inspection and certification, without danger of spreading the fruit worm to other regions.

McDaniel (E.). **Onion and Bulb Crops' Pest appears in State.**—*Quart. Bull. Mich. Agric. Expt. Sta.*, x, no. 2, pp. 48–52, 3 figs. East Lansing, Mich., November 1927.

As a result of cold, wet weather in the spring of 1927 in Michigan root maggots were particularly abundant, and the lesser bulb fly, *Eumerus strigatus*, Fall., was observed for the first time in the State. It breeds for preference in narcissus bulbs, but also in hyacinth, onion, potato, parsnip and in iris roots, especially those previously attacked by the iris borer, *Macronoctua onusta*, Grote. The fly seems to prefer weakened or diseased bulbs, though very young larvae can establish themselves in healthy ones. The life-history and the remedies suggested are practically the same as those recorded in Oregon [*R.A.E.*, A, xiv, 654]. Infested bulbs can frequently be detected by squeezing them between the thumb and finger, when they are found to be soft ; where the infestation is heavy, there is no difficulty in detecting it, as the whole interior of the bulb is destroyed. Such bulbs should be burnt or buried in a deep pit. The larvae thrive in warm, moist conditions and are not capable of migrating from one bulb to another. For pupation, the larvae leave the bulb for drier soil several inches away, but the midsummer generations pupate either on the foliage or about the neck of the bulb.

Besides using artificial remedies, field practices will help to eliminate the fly. The plants should be inspected frequently and any unhealthy plants removed or destroyed. The beds should be raked over as soon as the foliage ripens, filling in round the neck of the bulb in order to prevent the adults from ovipositing on the bulbs and to reduce the likelihood of the young larvae reaching their food supply. If the flies are present in great numbers and the foliage has ripened but not shrivelled away from the bulb, the tops might be cut off as close above the ground as is safe with a hoe, piling the soil over the cut ends. When bulbs are being dug they should be kept covered so that flies cannot oviposit on them. Bulbs ripened in the shade under a shed are not attacked even if the sides are open. Discarded or diseased bulbs should be removed promptly from the field at digging time, and old onions in adjacent fields should be ploughed under or removed from the ground.

Dibble (C. B.). **Value of Plowing for controlling Borer tested.**—*Quart. Bull. Mich. Agric. Expt. Sta.*, x, no. 2, pp. 58–59, 1 fig. East Lansing, Mich., November 1927.

With the object of determining the value of ploughing over maize fields against the corn borer [*Pyrausta nubilalis*, Hb.], a number of screened cages were placed to enclose small areas in fields that were known to have been infested in the previous season and had been ploughed over in the usual standard manner. Various conditions of soil and cover were tested, and in two cases the area was covered with additional badly infested maize stalks and manure before ploughing.

The cages were kept in position for 40 days (21st June–1st August), and in no case was any borer moth found, the total area under cages being 960 square feet. Ploughing therefore undoubtedly disposed of numbers of borers.

JONES (D. W.) & CAFFREY (D. J.). **Status of imported Parasites of the European Corn Borer.**—*Circ. U.S. Dept. Agric.*, no. 14, 7 pp., 3 figs. 3 refs. Washington, D.C., October 1927.

A survey is given of the parasites of the European corn borer [*Pyrausta nubilalis*, Hb.] imported from Europe and liberated in the United States between 1920 and July 1927. These are *Ceromasia* (*Masicera*) *senilis*, Mg., *Eulimneria crassifemur*, Thoms., *Angitia* (*Dioctes*) *punctoria*, Roman, *Pimpla* (*Exeristes*) *roborator*, F., *Microgaster tibialis*, Nees, *Phaeogenes planifrons*, Wesm., *Zenillia roseanae*, B. & B., *Microbracon brevicornis*, Wesm., *Macrocentrus abdominalis*, F., *Apanteles* [*thompsoni*, Lyle], and two species of *Campoplex*. The first six have been recovered in the field. A total of 1,798,080 imported parasites of *P. nubilalis* has been liberated in infested fields in the United States. Ten large cages have been built at various points to aid in the conservation, recovery and spread of imported parasites. Their principal use is to hold large quantities of maize stalks infested by *P. nubilalis* together with the contained parasites, the progeny of the imported ones, which would otherwise perish during cleaning-up operations, and they also provide an effective method of accumulating information in regard to the status of the native parasites of the corn borer.

WORTHLEY (L. H.) & CAFFREY (D. J.). **Scouting, Quarantine and Control for the European Corn Borer, 1917-1926.**—*Tech. Bull. U.S. Dept. Agric.*, no. 53, 142 pp., 39 figs., 6 refs. Washington, D.C., December 1927.

A concise and comprehensive account is given of the control measures used against *Pyrausta nubilalis*, Hb. (European corn borer) in the United States from 1917–1926. The bionomics and distribution are only briefly discussed [*R.A.E.*, A, xv, 285]. The methods of scouting used to delimit known infested areas and to determine the possible presence of isolated infested areas, and the means by which Federal Quarantines are administered are described. Cultural and mechanical methods of control are discussed at length, and special treatments effective under certain conditions are given. Dusts, sprays and fumigants are considered ineffective and pasturing animals in infested fields is not recommended.

RUGGLES (A. G.) & ARNY (A. C.). **European Corn Borer.**—*Spec. Bull. Univ. Minnesota Agric. Extens. Div.*, no. 116, 8 pp., 5 figs., 9 refs. St. Paul, Minn., October 1927.

This popular account of the European corn borer [*Pyrausta nubilalis*, Hb.], published in view of the possible spread of the moth into Minnesota, includes a brief outline of its distribution, life-history and habits, and advocates various control measures, some of which, such as crop rotation, should be applied immediately.

EYER (J. R.) & McCUBBIN (W. A.). **Grape Insects and Diseases.**—*Bull. Pennsylvania Dept. Agric.*, ix, no. 16, Gen. Bull. 433, 27 pp., 12 figs. Harrisburg, Pa., September 1926.

This popular account of the more injurious grape pests of Pennsylvania includes the following insects: *Erythroneura comes*, Say (grape leafhopper), *Fidia viticida*, Walsh (grape root-worm), *Polychrosis viteana*, Clem. (grape berry moth), *Macrodactylus subspinosus*, F. (rose chafer), *Popillia japonica*, Newm. (Japanese beetle), *Haltica chalybea*, Ill. (grape flea-beetle), and *Parastichitis* (*Hadena*) *arctica*, Boisd., and *Porosagrotis vetusta*, Walk. (climbing cutworms). The nature of the injury is indicated in each case, with notes on remedial measures. Several improved types of booms, which insure thorough cover of spray on the lower surfaces of the leaves, are described, and spray schedules are given.

Annual Report 1926.—*Bull. Pennsylvania Dept. Agric.*, ix, no. 23, Gen. Bull. 436, 85 pp., 18 figs. Harrisburg, Pa., December 1926.

In the section dealing with insect pests, the position regarding *Popillia japonica*, Newm. (Japanese beetle) is discussed; it has now spread over approximately 5,325 sq. miles in south-eastern Pennsylvania and occurs throughout New Jersey, and to a limited extent in Delaware, New York and Connecticut. The two imported parasites, *Centeter cinerea*, Ald., and *Tiphia popilliavora*, Rohw., have become definitely established, and others have been received and released. A spray of lead arsenate and flour is still considered the best form of control, but especially in the case of attacks on ripened fruits, the use of geraniol as an attractant, followed by the application of a contact spray, has been found of value.

Pyrausta nubilalis, Hb. (European corn borer) is now established in north-western Pennsylvania and is regarded as one of the most serious insect pests in the State, having been known to cause complete destruction of the maize crop in some areas. Quarantine measures are very strictly maintained.

Cydia (*Laspeyresia*) *molesta*, Busck (oriental fruit moth) is now believed to be present in practically all the peach-growing districts of the State and is especially destructive to mid-season and later variety peaches, often giving 100 per cent. infestation; it also attacks quinces, which are usually so badly infested as to be practically worthless. It is also feared that the insect may become a serious pest of apple, on which it causes an injury similar to that of the codling moth. Two parasites of *C. molesta*, *Macrocentrus ancylivora*, Roh., and *Glypta rufiscutellaris*, Cress., are common throughout the southern part of the State, but have not as yet been found to be effective. No control methods tried have given complete satisfaction; pyrethrum-soap emulsion and sodium fluosilicate have proved more effective against the larvae than nicotine.

In one locality in 1926, *Epilachna corrupta*, Muls. (Mexican bean beetle), which has extended its range in the south-west of the State, caused serious damage to beans; for the most part, however, the infestation was not heavy.

Minor insect pests recorded during the season were: *Luperodes thoracicus*, Melsh., which caused damage in a single orchard [*R.A.E.*, A, xv, 262]; *Hemerophila pariana*, Clerck (apple and thorn skeletoniser), which attacked apple and *Crataegus*, but was controlled by the ordinary codling moth sprays; *Bucculatrix canadensisella*, Chamb. (birch leaf skeletoniser); *Chalepus dorsalis*, Thunbg. (locust leaf-miner), which was very destructive in the southern half of the State, wherever the black locust [*Robinia pseudacacia*] was present, and in one instance left the locust trees, which were so badly damaged that the leaves withered, and attacked a crop of soy beans in a neighbouring field; and *Plagiodera versicolora*, Laich. (imported willow leaf beetle), which attacks willow and poplar.

Entomology.—*Ann. Rep. Iowa Agric. Expt. Sta. 1925–26*, pp. 39–43. Ames, Iowa [1927].

Control measures against the Hessian fly [*Mayetiola destructor*, Say] have been so successful that no commercial damage was caused either in 1925 or 1926. Garden and field crops, including potatoes, tomatos, maize and oats were attacked in 1925 and 1926 by the common stalk borer [*Papaipema nitela*, Gn.], while early injury was caused in 1926 in many maize fields by the sod webworm [*Crambus* sp.]. Autumn ploughing is a successful method of controlling webworms and cutworms. The apple maggot [*Rhagoletis pomonella*, Walsh] caused severe injury to apples, appearing at several points south of its usual range. An injury known as witches' broom that occurred on gooseberry bushes in 1925 was found to be due to the Aphid, *Myzus houghtonensis*, Troop. *Listronotus rudipennis*, Blatchley, attacked carrots in 1925, causing losses amounting to 50 to 90 per cent. of the crop.

DOZIER (H. L.). **Department of Entomology.**—*Bull. Delaware Agric. Expt. Sta.*, no. 152 (Ann. Rep. 1926–27), pp. 19–25. Newark, Del., November 1927.

Measures against the codling moth [*Cydia pomonella*, L.] in Delaware included the cleaning of infested picking baskets [*R.A.E.*, A, xv, 149], which gave excellent results, and combined with continuous spraying and the scraping of rough bark from old trees effected in one case a reduction in "stung" and infested fruit from 91 per cent. in 1925 to 20 per cent. in 1926 over 400 acres. Dissections of infested apples showed that only a small percentage of the infestation was due to the oriental peach moth [*C. molesta*, Busck]. Some of the eggs of *C. pomonella* were parasitised by *Trichogramma minutum*, Riley, and dead larvae discovered beneath bands in April 1927 had apparently been killed by a fungus, *Beauveria* (*Sporotrichum*) *globulifera*. Under packing-house conditions in 1927 *C. molesta* began to emerge on 6th May and *C. pomonella* on 21st May. Good results have been obtained with fish-oil as an adhesive in the lead arsenate spray at the rate of 1 pt. to 100 gals.

Erythroneura comes, Say (grape leafhopper) was much less numerous in 1927 than in the previous year, in the autumn of which large numbers were killed by the fungus, *Entomophthora sphaerosperma*. A new spray of oleoresin of pyrethrum and soap was used with success against *Typhlocyba rosae*, L., at a dilution of 1 : 50 on a hot dry day, but gave negative results against *E. comes* at a lower temperature and greater humidity. Serious damage to apple trees was done in the summer of 1926 by *T. rosae*, which attacks the leaves and was also abundant on rose foliage in 1927. Adults of *Erythroneura hartii*, Gill. (red saddle-backed leafhopper), a less important pest of apple foliage, were found hibernating beneath the bark of apple trees in April. The pear psylla [*Psylla pyricola*, Först.], which was scarce in 1926, became abundant and destructive in pear orchards in 1927. *Aspidiotus perniciosus*, Comst. (San José scale), though present, is seldom injurious in orchards in Delaware, as it is kept in check by spraying and the parasite, *Prospaltella perniciosi*, Tower, large numbers of which were reared from the scale during 1927, in addition to a few specimens of *Aphelinus fuscipennis*, How.

Tests with a proprietary oil emulsion at a dilution of 1 : 32 applied on 15th April 1927 to peach trees in full bloom, heavily infested with *Lecanium* (*Eulecanium*) *nigrofasciatum*, Perg., showed that the application requires three weeks to take full effect. No injury was caused to the trees. The mortality rate, which was 73·8 per cent. on 26th April, had increased to 89·9 per cent. when a second count was made on 6th May, natural mortality on the control trees being 18·5 per cent. Serious losses in vineyards were caused in 1926 by the grape berry moth [*Polychrosis viteana*, Clem.], and it is necessary to include lead arsenate in the pre-blossom spray for its control. Other pests mentioned include : *Lepidosaphes ulmi*, L. (elm scale) on peonies, and the box leaf-miner [*Monarthropalpus buxi*, Lab.].

Smith (L. B.). **Preventing Spread of Japanese and Asiatic Beetles.**—*12th Rep. New Jersey State Dept. Agric. 1926–27*, pp. 91–102. Trenton, N.J., October 1927.

This is a review of the situation regarding the Japanese beetle [*Popillia japonica*, Newm.] in the United States, including the quarantines and biological and other measures directed against it. Brief notes are also given on *Anomala orientalis*, Waterh. (Asiatic beetle) and *Aserica castanea*, Arrow (Japanese garden beetle).

Compere (H.). **New Coccid-inhabiting Chalcidoid Parasites from Africa and California.**—*Univ. Calif. Pub. Ent.*, iv, no. 8, pp. 209–231, 3 pls. Berkeley, Cal., 1928.

The Encyrtids, *Neococcidencyrtus alula*, gen. et sp. n., from *Diaspis zamiae*, Morg., *Psilophryoidea comesor*, gen. et sp. n., from *Kermes cockerelli*, Ehrh., and *Microterys claripennis*, sp. n., from *Lecanium corni*, Bch., and the Eulophid (Aphelinid), *Physcus howardi*, sp. n., from *Aspidiotus californicus*, Coleman, are described from California; and the Encyrtids, *M. fuscipennis*, sp. n., from an undetermined Coccid that indents the leaves of *Chaetachme aristata*, *Metaphycus fuscicornis*, sp. n., from *Inglisia* sp. on cultivated cotton and *Leptomastix nigrocoxalis*, sp. n., from *Pseudococcus* sp., and the Miscogasterid, *Eunotiscus gahani*, gen. et sp. n., from *Pseudococcus* sp., from Natal. *Coccidencyrtus poutiersi*, Mercet, is referred to the genus *Neococcidencyrtus*.

Needed Lines of Investigation in American Entomology.—*Ann. Ent. Soc. Amer.*, xx, no. 4, pp. 419–460. Columbus, Ohio, December 1927.

This symposium includes the following papers:—

"Needs in the Study of Beneficial Insects," in which Dr. L. O. Howard points out the necessity for an intimate study of the biology and ecology of all beneficial parasites and predators taken species by species, in order that reliable group generalisations may be made, the importance of immediately recording all observations in print, and the need for international co-operation.

"Economic Entomology. The Needs in the Study of Insect Injuries," in which Dr. E. O. Essig emphasises the need for thorough fundamental training in order that the insect and its injury may be recognised, and for long experience in order that a sane and conservative estimate of the damage may be made and control measures only be advocated where their use is economically justifiable.

"Needs in the Study of Control Measures," in which Dr. W. P. Flint shows that continuous study of existing satisfactory control measures is necessary, since, owing to changing conditions, they may prove unsatisfactory in the future; he also stresses the importance of studying the ecology [*R.A.E.*, A, xiv, 531] and tropisms of insects, and the actual and ultimate effect of such measures as crop rotation and certain cultural practices on insects under the varying conditions that may occur in the same region at different seasons.

Clausen (C. P.). U.S. Bur. Ent. **The Bionomics of** ***Anastatus albitarsis*****, Ashm., parasitic in the Eggs of** ***Dictyoploca japonica*****, Moore (Hymen.).**—*Ann. Ent. Soc. Amer.*, xx, no. 4, pp. 461–473, 1 pl., 7 refs. Columbus, Ohio, December 1927.

Detailed observations were made on the bionomics of the Eupelmid, *Anastatus albitarsis*, Ashm., bred from the eggs of the Saturniid, *Dictyoploca japonica*, Moore, infesting deciduous forest and shade trees in Japan. The life-cycle of the host covers a period of one year, the winter being passed in the egg stage on the trunks and branches of the various food-plants. The eggs hatch in late April or early May, and the adult stage is reached late in the summer, the eggs being deposited during the latter part of September and in October. The field parasitism by *A. albitarsis* in four localities for a period of three years was 26 per cent., although in some instances it approached 100 per cent. for individual clusters, which often comprised a hundred or more eggs.

The process of oviposition is minutely described. In laboratory experiments with 10 females the average number of eggs laid by each was 60, deposited at the rate of 3·9 a day during a period of 15·3 days. The eggs are deposited in the egg of the host in the fluid surrounding the embryo, never within it. The larvae, which hatch in 3–5 days, lie free in the fluid, which is completely consumed. They are mature in a month and hibernate in this condition. The pupal stage lasts about two weeks, and the adults emerge during May shortly after the hatching of the host eggs. The females live until the following October or November, when freshly deposited host eggs are again available for oviposition. In cases of parthenogenetic reproduction, the progeny are all males. While one generation a year is normally observed, there is evidence to show that a partial second occurs in the infertile eggs of the host in the spring, and this was demonstrated experimentally in the laboratory. The immature stages are described. The primary larva of *A. albitarsis* is compared with those of other parasitic Hymenoptera, and the host relationships of the genus *Anastatus* are discussed, with notes on the literature dealing with its biology.

FINK (D. E.). U.S. Bur. Ent. **The Application of Studies in Hydrogen Ion Concentration to Entomological Research.**—*Ann. Ent. Soc. Amer.*, xx, no. 4, pp. 503–512, 2 figs., 5 refs. Columbus, Ohio, December 1927.

The following examples are given of the significance of hydrogen ion concentration in various problems of entomological research. Many injurious species of insects of economic importance pass at least part of their development in a soil medium, the acidity or alkalinity of which plays an important role in the development of the insect and incidentally in control. The application of studies in hydrogen ions to life-history work in general will lead to a greater insight into the process of growth and development. Moreover, a better understanding of food-plant preferences may be gleaned as a result of studies of the pH values of the body fluids of insects and of the plants upon which they feed. Of paramount importance in preventing injury to susceptible plants is a knowledge of the pH values of sprays. In studying the effect of arsenicals or other substances upon insects, the control of the hydrogen ion concentration of dilutions used in the experiments is essential in order to eliminate the influence which the H or OH ions may have upon insects. Studies on digestion and nutrition require a knowledge of the pH values of the alimentary tract.

Since the amount of fluid available for study is frequently very minute, the author describes the indicator method of determining pH values and the improved hydrogen electrode vessel that makes the potentiometer method available for use with small amounts.

Experiments were undertaken to determine by means of the potentiometer the reactions of the body fluids in a large number of insects belonging to several orders, and the relative changes in hydrogen ion concentration that may occur during the development of the insect from egg to adult. In general the differences in pH values between species is slight, but the differences between the averages for a few species of three orders is more marked, *viz.*, Lepidoptera, 6·53, Coleoptera, 6·85, and Orthoptera, 7·10. The pH values for the immature stages of *Leptinotarsa decemlineata*, Say, varied between 6·36–6·95.

ROBINSON (W.). **The Thermocouple Method of determining Temperatures.**—*Ann. Ent. Soc. Amer.*, xx, no. 4, pp. 513–521, 4 figs. Columbus, Ohio, December 1927.

The thermocouple method of determining temperatures is very well adapted for use in entomology, since with this method it is possible to determine temperatures of places that are otherwise inaccessible, such as in an atmosphere of poisonous gas when fumigating, or in the soil, in water or under the bark of trees. The internal temperature of insects under various conditions may also be found. The advantages of this method are discussed, and an outline is given of the principles involved. Detailed instructions are given for making thermocouples in the laboratory.

GRISWOLD (G. H.). **The Development of** *Coccophagus gossypariae*, **Gahan, a Parasite of the European Elm Scale.**—*Ann. Ent. Soc. Amer.*, xx, no. 4, pp. 553–555, 2 refs. Columbus, Ohio, December 1927.

While working on the biology of *Gossyparia spuria*, Mod., in the spring of 1924, it was found that 47 out of 163 males examined were parasitised by a Chalcid, subsequently named *Coccophagus gossypariae*, Gahan [*R.A.E.*, A, xv, 395]. The adult parasites began to emerge on 19th May and continued to do so for about two weeks, cutting a round hole in the body of the host and a second opening in the host's cocoon. In late June 316 female scale-insects were examined, of which 94 were found to contain parasites. The first adult Chalcids emerged on 9th July, at about the time the eggs of the scale hatch, and also proved to be *C. gossypariae*. There are, therefore, at least two generations of the parasite in a year, the first parasitising the male scales before they have fully matured and the second the female scales. At Ithaca *G. spuria* has only one generation a year, and it passes the winter in the second larval stage. The manner in which the parasite passes the winter is not yet known.

BRITTAIN (W. H.). **The Cabbage Maggot.**—*Bull. Dept. Nat. Resources Nova Scotia*, no. 11, 53 pp., 3 pls., 3 figs., 14 refs. [Halifax, N.S.] May 1927.

The results of ten years of investigation into the control of *Phorbia* (*Hylemyia*) *brassicae*, Bch. (cabbage maggot) in Nova Scotia are here summarised. Tests made with cultivated and wild crucifers revealed that all the former were highly susceptible to attack; some of the latter, however, have not yet been found to be infested. The ability of cabbages to recover from attack and produce a marketable crop varies considerably with different varieties, and may bear little relation to the susceptibility of seedlings to infestation. The type of injury caused by the maggot is discussed.

There are two overlapping generations of *P. brassicae* in a year and a partial third, but only the first causes serious injury to cabbage and cauliflower, the later ones preferring field turnips, which are then more succulent. The adults emerge over a period of 9–16 weeks, beginning in the latter part of May or early in June. Oviposition occurs 6–8 days after emergence under insectary conditions, but in the field eggs are found 2–3 days after the appearance of the adults. From 1918 to 1925 the first eggs were laid within 9 days after the first flowering of *Amelanchier canadensis* (shad bush); the relation of oviposition to temperature is less constant, but large numbers of eggs are rarely laid before the maximum temperature reaches 70° F. The largest number of eggs laid by any individual under observation was 103. On an average the eggs of both the first and second generations hatch in 5 days. In the first generation the larval stage lasted 16–23 days, and in the second 17–19 days, the pupal stages being 5–16 and 39–46 days respectively. Pupation sometimes takes place in the plants, but usually in the soil at a depth of 1–6 ins., or even more. The majority of the pupae of the second generation hibernate as such, although some produce adults that deposit eggs of a third generation.

The main problem in Nova Scotia is to prevent loss among early plants and seedlings, since once the transplants have become established, they are capable of withstanding attack. Methods of control are discussed [*R.A.E.*, A, xi, 85, 224, etc.]; it was found that the four best treatments, tried over a period of four years, *viz.*, 1 pt. mercury bichloride (corrosive sublimate) to 1,000 pts. water, creosote and clay (1 : 99), anthracene oil and clay (1 : 99) and a mixture of tobacco dust and mercury bichloride (99 : 1), all gave satisfactory results if applied at the correct time. Mercury bichloride was found to be the most convenient, and its use is recommended, the lowest dilution giving satisfactory results being 1 oz. to 10 gals. water; this should be applied at the rate of about 6 fl. oz. to each transplanted cabbage, or 1 gal. to 30 ft. of row of seedlings or radishes. Applications should be made when the first eggs are laid. When transplanting is not done until oviposition has begun, the first application should be made four days after the plants have been set out; a second, and if necessary, third, should follow at intervals of a week. Care should be taken that plants are not infested when taken from the seed bed; if infestation is present, three applications should be made at five-day intervals. Radishes, which are also attacked by first generation larvae, may be treated in the same way; turnips, which are attacked by the later generations, present only a minor problem; control is more difficult to secure, any infestation rendering them unsaleable, and the crops are of less value.

RUHMANN (M. H.). **Report of Assistant Entomologist, Vernon.**—*21st Rep. B.C. Dept. Agric. 1926*, pp. 38–42. Victoria, B.C., 1927.

Owing to the unusually mild winter of 1925–26 such insects as the black cherry aphis [*Myzus cerasi*, F.] and *Eriosoma* (*Schizoneura*) *lanigerum*, Hausm. (woolly apple aphis) overwintered successfully on the trees. During April and May, severe infestations of *Pseudococcus* sp. occurred on plum, apple and black currant. Injury by the bulb-mite [*Rhizoglyphus* sp.] was unusually severe and appears to be on the increase, the mites being widely distributed on bulbs from infested gardens. The abundance of *Magdalis aenescens*, Lec. (apple-tree bark-weevil) in one orchard was found to be due to the stacking of the limbs and trunks of old apple trees for firewood. Cutworms and wireworms caused considerable loss to field and garden crops. An unusual outbreak of *Leptocoris trivittatus*, Say, occurred in the autumn, when the bugs congregated in and around buildings seeking hibernating quarters. Considerable relief was obtained by spraying them with coal-oil. Early in April severe outbreaks of *Anabrus longipes*, Caud., occurred on vegetable crops in restricted areas.

The application of the cover spray against *Cydia pomonella*, L. (codling moth) at a fixed period after the calyx spray is not sufficiently accurate, since it should be applied just prior to or to coincide with the hatching period of the eggs. Owing to unfavourable climatic conditions a mortality of only 40 per cent. was obtained in further tests with calcium cyanide against *Eriosoma lanigerum* [*R.A.E.*, A, xv, 70]. The entire orchard was then treated with a spray containing ¾ pt. 40 per cent. nicotine sulphate, 2 lb. freshly slaked lime, 10 oz. casein and

100 gals. water, and a mortality of 98 per cent. resulted. The almost complete loss of a peach crop was due to a severe outbreak of *Oecanthus niveus*, DeG. (snowy tree cricket), which was found to be ovipositing and breeding in a patch of briars in the orchard. This is the first time that this insect has caused serious loss in British Columbia. Cyanogas calcium cyanide has given excellent results when used against ants. Two or three openings should be made in the nest, ½ oz. Grade A dust [*R.A.E.*, A, xiv, 74] poured into each and all the openings closed. It is usually only in the case of very large nests that a second application is necessary.

CURRAN (C. H.). **Calcium Cyanide Fumigation for the Control of Stored Product Pests.**—*Sci. Agric.*, viii, no. 5, pp. 332–335. Ottawa, January 1928.

Extensive investigations in the United States and Canada with calcium cyanide against insects in flour mills have shown that under favourable conditions the eggs are as effectively destroyed as other stages, and in view of this fact it appears that the thorough fumigation of a mill once a year, or in some parts of Canada, once in two years, will control pests and eliminate the danger due to the clogging of the machinery by the webbing of *Ephestia kühniella*, Zell. (Mediterranean flour moth). The application of the material is discussed; only cyanides giving a maximum concentration in not less than 6 hours should be used, as the margin of safety is then great enough to allow of a thorough application and for there to be no real danger from the fumes. Coarse grade cyanide should be used, and 2 lb. to 1,000 cu. ft. has been found to be sufficient; it is, however, advisable to adjust the dosage on different floors, to allow for the upward diffusion of the gas [*R.A.E.*, A, xvi, 193]. The building should also be thoroughly cleaned, not more than ½ in. flour being left anywhere, and all parts of the mill machinery should be opened up to allow direct access of the gas. The temperature of the mill should be above 65° F. and the relative humidity over 40 per cent., and from 60 to 80 per cent. if possible. The humidity may be increased by sprinkling water over the floors, but care should be taken not to apply the cyanide until all the water has evaporated; where sprinkling is not desirable, moist sacks may be hung up 3 hours previous to fumigation, and the mill closed to hold the moisture. The distribution of the calcium cyanide should be started on the top floor, and each workman should be given a supply of ammonium carbonate to inhale if the effects of the gas are noticed.

FREEMAN (W. G.). **Plant Pathology.**—*Rep. Dept. Agric. Trinidad & Tobago 1926*, pp. 35–36. Port-of-Spain, 1927.

Weather conditions in 1926 were favourable to the sugar-cane froghopper [*Tomaspis saccharina*, Dist.], the first brood of which appeared in July, the second in October and the third in December, the canes that were not killed outright recovering by the end of the year. *Castnia licus*, F. (large moth borer) was more numerous than usual on sugar-cane. On cacao no serious outbreaks of thrips [*Heliothrips rubrocinctus*, Giard] occurred, but a long drought greatly increased the numbers of the cacao beetle [*Stirastoma depressum*, L.]. The attacks of *Brassolis* [*sophorae*, L.] on coconut were not severe. Other pests recorded include *Remigia punctularis*, Hb. (*Mocis repanda*, auct.) (striped cane looper) on rice, and the pineapple Lycaenid, *Tmolus echion*, L. (*thulia*, Hew.), which was numerous and destructive.

Walters (E. A.). **Control of Insect Pests.**—*Rep. Agric. Dept. St. Lucia 1926*, pp. 9–10. [Trinidad] 1927.

While no serious infestation occurred on the principal crops in St. Lucia during 1926, the following minor pests were observed: *Diatraea saccharalis*, F. (moth borer) and the Tenebrionid, *Opatrinus* (*Hopatrinus*) *gemellatus*, Oliv., on sugar-cane; *Chionaspis citri*, Comst., and *Lepidosaphes beckii*, Newm., on *Citrus*; *Diaspis boisduvali*, Sign., *Aleurodicus cocois*, Curt., and *Pseudococcus nipae*, Mask., on coconuts; the Dynastid, *Ligyrus ebenus*, DeG. (*Tomarus bituberculatus*, P. de B.), and the weevils, *Cosmopolites sordidus*, Germ., and *Metamasius sericeus*, Ol., on bananas; and *Platyedra* (*Gelechia*) *gossypiella*, Saund., and *Eriophyes gossypii*, Banks, in small plantations of sea island cotton.

Ogilvie (L.). **Plant Quarantines and Inspection of Imported Plants.**—*Agric. Bull. Bermuda Dept. Agric.*, vi, no. 7, pp. 7–8. Bermuda, July 1927.

In addition to restrictions already noticed [*R.A.E.*, A, xii, 443; xiv, 626], this review of legislation affecting the importation of plants into Bermuda includes prohibitions against narcissus bulbs on account of the bulb flies, *Merodon equestris*, F., and *Eumerus strigatus*, Fall., and against carrots on account of *Psila rosae*, F. (carrot rust fly).

Whitney (L. A.). **Report of Associate Plant Inspector, April-September 1927.**—*Hawaii. For. & Agric.*, xxiv, no. 3, pp. 85–91. Honolulu July–September 1927.

The pests intercepted include: From California, *Pseudococcus maritimus*, Ehrh., on pears, apples, and ornamental plants, *P. citri*, Risso, on *Coleus* and rose plants, *P. gahani*, Green, on ornamental plants, *P. adonidum*, L. (*longispinus*, Targ.) on plant cuttings, *Orthezia insignis*, Dougl., on *Coleus*, *Macrosiphum rosae*, L., on *Hydrangea* and rose plants, *Sitodrepa panicea*, L., in dried peas, *Calandra* (*Sitophilus*) *oryzae*, L., in whole maize, *Aleurodes spiraeoides*, Quaint., on iris plants, *Chionaspis furfura*, Fitch, on pears, *Cydia pomonella*, L., on pears and apples, *Saissetia oleae*, Bern., on geranium and fuchsia, *Eriosoma lanigerum*, Hausm., on apples, *Lecanium* sp. on *Escallonia* sp., *Hylemyia antiqua*, Meig. (*ceparum*, Meig.) and *Stenopelmatus irregularis*, Scud., on green chives, and *Heliothis* (*Chloridea*) *obsoleta*, F., in green maize; from Pennsylvania, *Lecanium* sp. on rose plants, *Pseudococcus* sp. on *Strelitzia augusta*, and *P. adonidum* on *Dracaena sanderiana*; from New Jersey, *Coccus* (*Lecanium*) *pseudohesperidum*, Ckll., *Cerataphis lataniae*, Boisd., *Saissetia filicum*, Boisd., and *Diaspis boisduvali*, Sign., all on orchids; from New York, *Phenacoccus* sp. on *Salvia* sp., and *Pseudococcus maritimus* on dahlia tubers; from Ohio, *P. maritimus* on gladiolus bulbs; from New Zealand, *Pseudococcus adonidum* on apples, and *Tylococcus* sp. on a palm; from Australia, *Bruchus obtectus*, Say, in dry beans, *Calandra oryzae* in *Araucaria* seeds, and *Pseudococcus* sp. on pineapples; from the Philippines, *Chrysomphalus rossi*, Mask., *Parlatoria proteus*, Curtis, and *P. pseudaspidiotus*, Lind., on orchids, and *Necrobia rufipes*, F., in copra ; from Japan, *Pseudococcus comstocki*, Kuw., *Chionaspis euonymi*, Comst., and *Ceroplastes rubens*, Mask., on *Euonymus*, and *Calandra oryzae* in sweet cakes ; and from China, *C. oryzae*, *Lasioderma serricorne*, F., and *Sitodrepa panicea*, in stored products.

FRENCH, jr. (C.). **Treatment of Wood Borers.**—*J. Dept. Agric. Vict.*, xxv, pt. 11, pp. 672–674. Melbourne, November 1927.

This is a short and popular account of *Lyctus* [*brunneus*, Steph.] (powder post beetle) and *Anobium domesticum*, L. (furniture borer) with recommendations for their control [*cf.* *R.A.E.*, A, xiii, 228].

JARVIS (E.). **Entomological Advice to Canegrowers.**—*Queensland Agric. J.*, xxviii, pt. 6, pp. 554–555. Brisbane, 1st December 1927.

The second stage larvae of *Lepidiota frenchi*, Blackb., pass the winter in cells 15–20 inches below the surface of the ground. They usually moult for the last time when the warm weather commences and make their way to the upper and warmer portion of the soil, where they again begin to feed [*cf.* *R.A.E.*, A, xii, 173].

The treatment recommended is fumigation of the sugar cane stools with carbon bisulphide, injections of ¼ oz. being made on both sides of affected rows 15–18 inches apart and 4–5 inches from the nearest plants. At least four days should be allowed to elapse after a heavy rain before fumigating friable well-drained volcanic soils and 6–8 days in the case of clay-loam soils. The top soil should be well cultivated throughout the time that the insect is above ground.

BUZACOTT (J. H.). **Cane Boring Insects.**—*Queensland Agric. J.*, xxviii, pt. 6, p. 555. Brisbane, 1st December 1927.

In October 1927 the chief pest of sugar-cane in the Babinda district was *Rhabdocnemis obscura*, Boisd. Its Tachinid parasite, *Ceromasia sphenophori*, Vill., was firmly established on many farms, but apparently a recent cyclone had destroyed many of the adults and at the same time the humid weather and damaged cane provided ideal conditions for the increase of its host, which was observed in the tops of practically all injured cane. *Cirphis unipuncta*, Haw., had been very prevalent, and the leaves of 7 acres of young plant cane had been stripped to the midrib. At the time the inspection was made, the larvae had pupated in the soil, and since the Ichneumonid, *Lissopimpla scutata*, Krieg., one of the chief parasites of its pupae, was exceedingly abundant, it seemed improbable that a second outbreak would occur. Other insects injurious to cane were *Phragmatiphila truncata*, Wlk., and *Ephysteris chersaea*, Meyr. *Opogona glyciphaga*, Meyr. (bud moth) was common, but its larvae did not appear to be causing severe damage.

JARVIS (E.). **Cane Pest Combat and Control.**—*Queensland Agric. J.*, xxviii, pt. 6, pp. 556–558. Brisbane, 1st December 1927.

In one district of Queensland, the careless practice of high cutting has a tendency to encourage the activities and distribution of the

Tineid, *Ephysteris chersaea*, Meyr., which tunnels in the basal portion of young cane shoots (5–10 ins. high), biting through the central core and killing the heart leaves. Unlike the larvae of the Pyralid, *Fossifrontia* sp., the larvae of this species never feed on the central rotting core, often vacating a shoot as soon as they have tunnelled across the juicy basal portion, and entering another ratoon. In the district mentioned, *E. chersaea* attacks chiefly ratoons that, on account of high cutting, spring from buds above ground level, injury being far less noticeable among shoots of cane or first ratoon crops that spring from buried eyes.

The larvae and pupae of *Rhabdocnemis obscura*, Boisd., generally occur in the inch or two of cane stem immediately above the ground, especially in light infestations. One of the best means of controlling this beetle is to cut the crop close to the ground so that practically all the larvae and pupae are removed from the plantation and destroyed during the process of milling.

BUZACOTT (J. H.). [**Report of the Assistant to the Entomologist at Meringa.**]—*Queensland Agric. J.*, xxviii, pt. 6, pp. 563–564. Brisbane, 1st December 1927.

A small Crabronid was found making nests in the stems of *Sorghum* near the seed head by tunnelling out the pith and filling the burrow, which was about 1 ft. long, with small flies. Nearly every stem was attacked, but neither the growth nor the seeding of the plants seems to have been affected, though the weakened stems would probably break in a heavy wind. It is most unlikely, however, that this insect would attack sugar-cane.

MUNGOMERY (R. W.). [**Report of the Southern Assistant Entomologist, October-November, 1927.**]—*Queensland Agric. J.*, xxviii, pt. 6, pp. 564–565. Brisbane, 1st December 1927.

The cane root Aphid mentioned in a previous report [*R.A.E.*, A, xvi, 98] has now been found attacking young plant cane attended by an ant, *Pheidole proxima*, Mayr. The cane was noticeably yellow and appeared to be very weak. The winged form has not yet been found, but an attempt is being made to breed it in order to establish its identity. The wingless viviparous female is briefly described. This Aphid has not been found on roots from which ants were absent. Ploughing the cane will not be sufficient to control it, since it has been found feeding on nut grass [*Cyperus rotundus*], on which it would doubtless survive during the time the land was fallow, subsequent generations reinfesting newly planted cane. The extermination of the ants seems to be the real solution of the problem. *P. proxima*, which is very common in the cane-fields, not only attends such sap-sucking insects as Aphids and Coccids, but has been found tunnelling under the hard rind and eating the softer central portion of the cane. The undermining of the rind at the nodes from which the roots spring prevents many of the roots from developing normally. It has also been found nesting in portions of cane stools and is probably responsible for more damage than has been hitherto supposed.

JARVIS (E.). **Turning Cane Pests to profitable Account.**—*Queensland Agric. J.*, xxviii, pt. 6, pp. 565–568, 1 pl. Brisbane, 1st December 1927.

Various methods of profitably disposing of the larvae and adults of *Lepidoderma albohirtum*, Waterh., are described ; they include their conversion into manure, their use as poultry and cattle food, and the extraction of oil and fat from them.

VEITCH (R.). **The Corn Ear Worm on Tomatoes.**—*Queensland Agric. J.*, xxviii, pt. 6, pp. 585–588, 1 pl. Brisbane, 1st December 1927.

An account is given of life-history and habits of *Heliothis obsoleta*, F., on tomatos in Queensland [*R.A.E.*, A, xii, 89], and the various stages are very briefly described. The eggs are parasitised by *Trichogramma australicum*, Gir., *T. rarum*, Gir., and a species of *Neotelenomus*, and also destroyed by an Anthocorid, *Triphleps australis*, China [*R.A.E.*, A, xiv, 226]. The control measures advocated include rotation of crops, thorough cultivation and spraying or dusting with lead arsenate.

BALLARD (E.). **Cotton Growing in Queensland. Part II. Pests of Cotton in Queensland.**—*Queensland Agric. J.*, xxviii, pt. 6, pp. 589–614, 6 pls. Brisbane, 1st December 1927.

An account is given of the more common pests of cotton in Queensland. The bionomics and the usual measures of control are described, the important pests being dealt with in some detail.

FOWLER (R.). **Further Investigations into Codling Moth Control.—Second Report on Experiments carried out at Blackwood Experiment Orchard.**—*J. Dept. Agric. S. Aust.*, xxxi, no. 5, pp. 480–492. Adelaide, 15th December 1927.

Experiments have been carried out with various forms of bait for use against *Cydia pomonella*, L. (codling moth) as supplements to spraying, since the importation into England of apples bearing even a trace of arsenic is prohibited and spraying seems to have become less efficient in recent years. The best container for the bait is a 2 lb. glass jam jar ; more moths are caught in those with large openings, but these allow of a heavy evaporation and need refilling constantly. It will be found necessary to replenish 2 lb. jars every 7 or 8 days. Of the solutions used a bait of fermented apple juice [*R.A.E.*, A, xiv, 363] gave the best results, 499 moths being caught in 12 jars during the season, while a solution of fermented apple and 10 per cent. by weight of sugar caught 307, and a molasses solution made by dissolving 1 pint molasses in 3 pints of water and adding a little yeast powder caught 359, each in an equal number of jars. The apple solution was, however, used on the row of apple trees carrying the best crop and also caught the greatest number of beneficial insects. It was found that, where practicable, it was most effective to place the traps in the upper third of the tree and on the shaded side to prevent evaporation so far as possible. In an orchard ¾ acre in area, during a period when the codling moth was not numerous and the apple crop was poor, approximately 53 per cent. of the moths caught were females, and the majority of these appeared to contain a large number of eggs ; this percentage represents about 626 moths, which would be capable of producing about 16,276 eggs, or as many larvae as there were fruits in the orchard. The author, however, considers that the greatest value of traps lies in their influence in determining the dates of maximum emergence, so that it is possible to fix a spraying schedule. A table is given showing the results of trapping tests in 1926–27 ; there appear to be two distinct broods, but the dates of emergence do not coincide with the dates of 1925–26. The maximum number of moths were caught from the last week in October until the end of November ; there was then a decline until early January, when the numbers rose until the middle of February. It is thought that, although trapping throughout the season may be impracticable, during these periods it would be worth while. The first moths were also caught towards the end of October in a packing shed, but did not emerge till December in a cool store room.

The spray that gave the best results consisted of 2 lb. lead arsenate powder to 50 gals. water, this being ½ lb. more than is generally used. Five applications were made, and only 7·83 per cent. of the fruit was infested and 10 larvae taken to 100 lb. of fruit gathered. The addition of lime-sulphur or 40 per cent. nicotine sulphate did not improve the efficacy of the spray to any appreciable extent. The results of tests in which 12 oz. calcium caseinate was used as a spreader vary somewhat from those obtained in the preceding year, when a 50 per cent. increase of arsenate without a spreader gave the best results. In the 1926–27 season the figures in the four tests approximate so closely that little benefit can be claimed either for the additional arsenate or the spreader ; it is, however, recommended that at least 4–5 applications of 2 lb. arsenate powder to 50 gals. water with some form of spreader be used. It would again seem that there is no relation between the number of moths taken in traps and the percentage of fruit infested, while the bait appears to be more attractive than the apples on the tree, several instances having been noted of a large number of moths being caught on trees where there was practically no crop. The value in the use of bands for trapping the larvae is indicated by the fact that 494 were caught from 48 trees. Experiments were also made with a dusting powder, but the results obtained were not so good as those from spraying. Other tests showed that calyx sprays should not be omitted ; they should be made thoroughly and with good pressure. The earliest application was made on 25th October, the day the first moth was caught, and within a few days the catch was 82, indicating that a large number of moths are present at the time of the calyx spray.

BRYDEN (J. D.). **Sheets for fumigating Citrus Trees.**—*Agric. Gaz. N.S.W.*, xxxviii, pt. 12, p. 944. Sydney, December 1927.

Notes are given on the handling and storing of sheets used in the tent fumigation of *Citrus*, with a table showing the different sheets needed for trees of various sizes.

RAMSAY (A. A.). **Analysis of Lead Arsenate of various Brands.**—*Agric. Gaz. N.S.W.*, xxxviii, pt. 12, pp. 945–948. Sydney, December 1927.

An examination of the various brands of lead arsenate procurable on the market in July 1927 has been made ; tables are given to show the composition of the brands, the composition calculated on a moisture free basis, the relative amounts of diplumbic and triplumbic arsenate present, and the rates at which settlement takes place from an aqueous suspension. Failure to obtain adequate control of the codling moth [*Cydia pomonella*, L.] has often been attributed to the quality of the lead arsenates, but experiments have shown that diplumbic arsenate has a greater killing power than triplumbic, and the lead arsenates now prepared contain a higher percentage of this than was contained in the same brands in 1920, while the arsenic content in the brands available is 49 per cent. greater than in 1910.

First Annual Report of the Council for Scientific and Industrial Research, 13th April 1926-30th June 1927.—8vo, 64 pp. Melbourne, 1927.

Among problems of entomological interest included in the research work undertaken by the Council are investigations on the underground grass grub [*Oncopera intricata*, Wlk.,] in Tasmania, insect pests of dried fruit, the lucerne flea, *Sminthurus viridis*, L., in South Australia, and the biological control of prickly pear, St. John's wort [*Hypericum perforatum*] and ragwort [*Senecio jacobaea*].

Cavadas (D. S.). **Greece: Bacterial Diseases of Tobacco in Connection with *Gnorimoschema heliopa* in Thessaly.**—*Int. Rev. Sci. Pract. Agric.*, xviii (N.S.), no. 11, pp. 693–694T. Rome, December 1927.

Bacterial diseases on tobacco appear first on plants attacked by the moth, *Phthorimaea* (*Gnorimoschema*) *heliopa*, Lw., and afterwards spread to other plants. This moth occurred in numbers in Thessaly in 1927 for the first time.

Novak (P.). **Some less known Insects causing Damage in Dalmatia.**—*Int. Rev. Sci. Pract. Agric.*, xviii (N.S.), no. 11, pp. 694–695T. Rome, December 1927.

The vine-moth, *Polychrosis botrana*, Schiff., has three generations a year in Dalmatia, the larvae of the third being associated with those of *Cryptoblabes gnidiella*, Mill., which only appear when the grapes are almost ripe. Vines in various localities are also seriously injured by the larvae of a large Melolonthid (? *Polyphylla lesinae*, Reitt.), which occur in sandy soils, and by the adults of *Otiorrhynchus polycoccus*, Gyll., which attack the buds and young shoots. *O. dalmatinus*, Gyll., is a pest of the olive, eating the leaves and also the flowers in May. Larvae resembling those of *Cebrio insularis*, Chevr., are locally serious pests of water-melons, gnawing the underground parts and causing the plants to die.

Poutiers (R.). **La résistance des insectes au froid.**—*Prog. agric. vitic.*, lxxxix, no. 5, pp. 120–121. Montpellier, 29th January 1928.

There is a danger in relaxing vigilance in the employment of control measures against insect pests in the belief that they have been killed by cold. Recorded instances of the survival of insects through extreme cold are cited. Sudden cold in December 1927 in the district of Mentone, where the temperature sometimes falls to —8° C. [17·5° F.], though fatal to many late-flowering plants, had no effect on insects, except where they were deprived of their food-plants and died for lack of nourishment. The examination of numerous examples of *Chrysomphalus dictyospermi*, Morg., *Ceroplastes sinensis*, DelG., *Pseudococcus citri*, Risso, and *C. rusci*, L., showed that they had not suffered.

Metalnikov (S.) & Chorine (V.). **Maladies bactériennes chez les chenilles de la pyrale du maïs** (*Pyrausta nubilalis* **Hübn.**).—*C.R. Acad. Sci. Fr.*, clxxxvi, no. 8, pp. 546–549, 5 refs. Paris, 1928.

Microscopic analysis of the blood of dead and diseased larvae of *Pyrausta nubilalis*, Hb., from stalks of *Artemisia vulgaris* in France, showed the presence of an enormous number of micro-organisms, from which 9 different species were separated. Two of these, one a coccobacillus resembling the bacilli described by White [*R.A.E.*, A, xii, 215], the other a vibrio resembling *Coccobacillus acridiorum*, were extremely pathogenic to the larvae, whether injected or ingested by the mouth; the other organisms were only fatal when injected into the blood. Experimenting with the first, the authors found that a 0·005 cc. dose of a 24 hours culture in ordinary broth, injected into the blood, killed 100 per cent. of the larvae in 3–4 hours, while injecting the same amount of blood from a diseased larva killed healthy larvae in 1½–3 hours, at the temperature of the laboratory. A mortality of 95–100 per cent. was also obtained by infecting larvae by the mouth. Similar results were obtained with the organism resembling *C. acridiorum*, and the authors suggest the possibility of using these in the control of the pest.

Perrot (E.). **Doit-on conseiller la culture du pyrèthre insecticide?**—*Rev. hort. Algérie*, xxxi, no. 12, pp. 274–276. Algiers, December 1927.

In view of the fact that the French market at present buys from abroad upwards of a thousand tons of pyrethrum flowers a year, the cultivation of this plant in France for insecticidal purposes is advocated. Indications are given as to the districts in which the soil is most favourable to its growth, and methods of cultivation and harvesting likely to render the undertaking reasonably profitable are suggested.

Suire (J.). **La teigne des poireaux,** *Acrolepia assectella*.—*Bull. Soc. Hist. nat. Hérault*, 1926, reprint 3 pp., 9 refs. Montpellier [1926].

The Tineid, *Acrolepia assectella*, Zell., has recently caused considerable damage to garlic and particularly leeks in the neighbourhood of Montpellier. The adult is briefly described. Oviposition takes place in the spring, the eggs being laid on the inner surface of the leaves. Two or three weeks later the larvae may be observed on leaves that are beginning to turn yellow, but they soon abandon them to tunnel into the bulb, which they leave again before pupating, remounting the stem to soil level, or 2 or 3 inches above it, and boring their way out from the plant to spin their cocoons. A second generation appears at the end of summer or beginning of autumn, some of the pupae of which give rise to adults the same year, while the others hibernate. *A. assectella* is parasitised by an Ichneumonid, *Limnerium gracile*, Gr. The degree of injury caused by the larvae varies according to the locality. In an outbreak occurring in 1885 near Paris 50 to 75 per cent. of the crop was destroyed on open hillsides, while in the sheltered plain the damage amounted to only 5–10 per cent. The distribution of the moth in Europe and its history in France are briefly discussed Control measures advocated are similar to those already noticed [*R.A.E.*, A, vi, 442 ; viii, 177]. It is, however, sometimes necessary to stop cultivation for an entire year in order to destroy the moth by starvation.

FEYTAUD (J.). **Les insectes parasites du pin. Les hylésines ou myélophiles** (*Myelophilus piniperda*, **L., et** *Myelophilus minor*, **Hartig**).—*Rev. Zool. agric.*, xxvi, nos. 8–9, pp. 113–121, 140–144, 8 figs., 10 refs. Bordeaux, August–September 1927.

An account, chiefly taken from the literature, is given of the bionomics of *Myelophilus piniperda*, L., and *M. minor*, Htg. A list of their natural enemies is included, and the usual methods of forest management used for their control are discussed.

VOGT (A.). **Unsere Spargelfeinde.** [Pests of Asparagus in Germany.]—*Int. ent. Z.*, xxi, no. 41, pp. 386–388. Guben, 1st February 1928.

Pests of asparagus in Germany include *Crioceris asparagi*, L., and *C. duodecimpunctata*, L., which have several generations a year, the first eggs being laid on the young leaves in April. The larvae completely destroy the leaves, but may be controlled by a spray containing 1 lb. Urania green and 10 lb. slaked lime in 100 gals. water.

Platyparea poeciloptera, Schr., appears at the same time as the earliest beetles. The flies, which hibernate as pupae in the underground stems, oviposit in the scales of the asparagus heads, into which the larvae bore, making their way downwards, until the autumn, when pupation takes place. Attacked shoots, which appear stunted and twisted and soon turn yellow and die, should be pulled up and burnt.

ZACHER (F.). **Das Auftreten des Messingkäfers im Jahre 1927.** [The Occurrence of *Niptus hololeucus* in Germany in 1927.]—*NachrBl. deuts. PflSchDienst.*, viii, no. 2, pp. 11–13. Berlin, February 1928.

Much of the information given here on the Ptinid, *Niptus hololeucus*, Fald., has been noticed from another paper [*R.A.E.*, A, xvi, 215]. The female lays about 15–20 eggs. Pupation lasts about 18–22 days at 19° C. [66·2° F.] and about 26 days at 11°–15° C. [51·8°–59° F.]. At 16°–20° C. [60·8°–68° F.] development from the egg to the emergence of the adult apparently requires some 6 or 7 months. Larvae have been found in woollen goods in Thuringia, but though they fed on woollen cloth in the laboratory, they died later. The beetles feed on various materials of animal and vegetable origin. A list is given of localities where *N. hololeucus* was recorded in 1927 in Germany, Switzerland, the Tyrol and Poland. Measures should be directed against the breeding-places. Experiments with baits showed that a weak solution of amyl acetate (1 drop in 3½ oz. of 50 per cent. alcohol), renders them more attractive to the beetles.

Körting (A.). **Zur Kenntnis der Ueberwinterung einiger an Gräsern lebender Thysanopteren. Vorläufige Mitteilung.** [The Hibernation of some Thysanoptera living on Grasses. Preliminary Communication.]—*NachrBl. deuts. PflSchDienst.*, viii, no. 2, pp. 13–15. Berlin, February 1928.

This paper is supplementary to one already noticed [*R.A.E.*, A, xiii, 102] and gives the results of observations on the plants used as winter quarters in North Germany by *Limothrips cerealium*, Hal., *L. denticornis*, Hal., *Haplothrips aculeatus*, F., and *Aptinothrips rufus*, Gmel.

MacDougall (R. S.). **The Biological Control of Insect Pests.**—*Scot. J. Agric.*, xi, no. 1, pp. 25–33, 2 pls., 6 refs. Edinburgh, 1928.

The meaning of the biological control of insect pests is explained and illustrated by accounts of its practical application in various parts of the world.

Gray (W. G.). **Cockchafers in the Forest Nursery.**—*Quart. J. For.*, xxi, no. 4, pp. 265–268, 1 fig. London, October 1927.

This is a more detailed account of the damage caused by and the control of *Melolontha melolontha* L. (*vulgaris*, F.), *Serica brunnea*, L., and *Amphimallus* (*Rhizotrogus*) *solstitialis*, L., given in a previous paper [*R.A.E.*, A, xvi, 238].

The Felted Beech Coccus (*Cryptococcus fagi* **Bärensp.**).—*Leafl. For. Comm.*, no. 15, 4 pp., 1 fig. London, October 1926.

Cryptococcus fagi, Bär. (felted beech coccus) is entirely confined to the beech (*Fagus sylvatica*), the common beech being more subject to attack than copper beech. The scale is widely distributed in Britain, but has only been recorded from one locality in Ireland. As a rule it only occurs on the main trunk and larger branches, although on young trees the smaller branches are often seriously infested. It is generally restricted to a comparatively small area, or to isolated trees, especially if these are sheltered from the prevailing wind; when they are exposed, the scale will almost always be found on the sheltered side of the tree. It becomes covered with a white felted secretion soon after hatching, and then remains stationary throughout its life. The larvae as a rule work themselves through the body of the adult scale, establishing themselves in fissures of the bark, usually very close to the adult. Larvae that wander over the bark are liable to be scattered by the wind or by birds and insects, new colonies probably starting in this way. Reproduction is parthenogenetic, males being unknown. The scale seems to be immune from parasites and is not attacked by birds, but there is no evidence that it is a serious enemy of the beech.

Trees should be treated in the dormant condition, the wash recommended being composed of ½ lb. sulphate of iron, ¼ lb. lime, 5 pints paraffin (solar distillate), 2 lb. caustic soda (98 per cent.) and sufficient water to make the whole up to 10 gals. The sulphate of iron should be dissolved in about 9 gals. water, and enough water be added to the lime to make it into a milk; these two solutions should be strained and then thoroughly churned with the paraffin, the caustic soda being added just before using. The caustic soda helps to clear the tree of lichens and algae. A paraffin emulsion alone will be found to be satisfactory on tree trunks that are only infested with the Coccid. For isolated trees scrubbing with a stiff brush is more effective than spraying.

LEES (A. H.) & STANILAND (L. N.). **Further Experiments with Tar-distillate Washes.**—*J. Minist. Agric.*, xxxiv, no. 10, pp. 923–931, 15 figs., 8 refs. London, January 1928.

Further trials have been made with two proprietary tar-distillate washes [*cf. R.A.E.*, A, xiv, 464], and the following is taken from the authors' conclusions: In field trials with Mortegg and Carbokrimp, at strengths of 4, 8 and 10 per cent., the eggs of *Psylla* [*mali*, Schmid.] and *Aphis pomi*, DeG., were controlled effectively by all three strengths. The 10 per cent. strength for both washes gave a small but consistent improvement over the 8 per cent. in the amount of control obtained on the eggs of Tortricids, small winter moth [*Cheimatobia brumata*, L.] and Capsids. The effect of considerable rain following the application of 5 and 2½ per cent. Carbokrimp, after preliminary drying, was to lower the effectiveness of the spray, both experimentally and in field trials.

The time at which spraying with Carbokrimp became dangerous on four varieties of plums depended on the strength employed and on the condition of the buds. This condition could not be determined by the calendar dates, and only to some extent by the appearance of the bud. Some other method applicable in the field is necessary. The time at which a 10 per cent. strength of Carbokrimp became dangerous to black currant was shown to be after the buds had already become distinctly swollen.

WILSON (G. F.). **Some Pests of Water Lilies.**—*J. R. Hortic. Soc.*, liii, pt. 1, pp. 81–91, 4 pls., 1 fig., 19 refs. London, January 1928.

The following insects have been recorded as pests of cultivated water-lilies in Britain: The caddis-flies, *Halesus radiatus*, Curt., and *Limnophilus marmoratus*, Curt., *Rhopalosiphum nymphaeae*, L. (water-lily aphis), *Galerucella* (*Galeruca*) *nymphaeae*, L., *Nymphula* (*Hydrocampa*) *nymphaeata*, L., and a midge, *Cricotopus ornatus*, Meig. Brief descriptions of these pests are given, together with notes on their life-history and control.

CORNELI (E.). **Osservazioni e ricerche su** *Tingis pyri* **Fabr. nell' Umbria.** [Observations and Investigations on *Stephanitis pyri* in Umbria.]—*Curiamo le piante!*, 1927, no. 11–12, reprint 7 pp., 8 refs. Perugia, R. Osserv. Fitopat., Umbria, October 1927.

In observations on *Stephanitis* (*Tingis*) *pyri*, F., in Umbria, the adults hibernated under fallen leaves of hawthorn. On 20th April they were seen on the young leaves of hawthorn and early in May many had migrated to those of apple. The mating period extended from the end of April to mid-May. Oviposition began 4–5 days after mating, and the eggs were laid in the parenchyma of the lower leaf-surface. When, as usual, the eggs were laid in groups, the numerous punctures formed injured patches. The adults of the first generation appeared about 20th June, and it was then that the injury was greatest. In the experimental plots the first generation was almost entirely destroyed by a nicotine spray. The survivors mated in July, and a second generation developed on apple and to a less degree on hawthorn. The adults of this generation migrated to pear trees planted among the apples, possibly owing to lack of food caused by the infestation, and the third generation occurred almost exclusively on pear. The hatching of the third generation began in the second half of August and continued into September, in which month the larvae, nymphs and adults injured pears, apple and hawthorn remaining almost untouched. The adults then returned to the hawthorn and sought their winter quarters. Privet (*Ligustrum vulgare*) is also infested. The injury, which is usually severe, consists in the loss of sap, the destruction of the parenchyma, and the prevention of the functions of the leaf owing to the covering of excreta. The larvae and adults of a Capsid were occasionally noticed preying on *T. pyri*.

Dusting with tobacco proved unsatisfactory; spraying with oil emulsion was somewhat better, but the best results were given by a solution containing 1 per cent. phenicated tobacco extract and 1 per cent. soft soap. One application at the end of June destroyed nearly all the larvae and nymphs, though some of the more active adults escaped.

BERTOLINI (F.). **Ricerche biologiche ed istologiche sulla** *Pieris brassicae*. [Biological and histological Investigations on *P. brassicae*.]—*Redia*, xvi, no. 1–2, pp. 29–39, 15 refs. Florence, 1927.

These studies largely deal with the differences, particularly colouring, in the larvae and pupae of the two generations of *Pieris brassicae*, L., and with the external factors influencing them.

MELIS (A.). **Una nuova specie di** *Lasioptera* **dell' olivo.** [A new Species of *Lasioptera* from the Olive.]—*Redia*, xvi, no. 1–2, pp. 41–43, 1 fig., 1 ref. Florence, 1927.

A Cecidomyiid, *Lasioptera brevicornis*, sp. n., is described from Italy from the olive; it oviposits in the fruits attacked by the olive fly, *Dacus oleae*, Gmel.

BERLESE (A.). **Per la lotta contro la mosca delle olive** (*Dacus oleae* **Rossi**). [Work against the Olive Fly, *D. oleae*.]—*Redia*, xvi, no. 1–2, pp. 111–125. Florence, 1927.

The situation regarding *Dacus oleae*, Gmel., in Italy in 1926 is reviewed, and it is concluded that at the present time the action of natural enemies cannot be relied upon, but that the olive crop can be saved in all cases by a careful application of bait-sprays.

BERLESE (A.). **Uso razionale dei mezzi insetticidi.** [The rational Use of Insecticides.]—*Redia*, xvi, no. 1–2, pp. 127–137. Florence, 1927.

This is a discussion of modern methods of the artificial control of insects by means of sprays and baits, with the modifications necessary according to the habits of the pest involved.

[GOLOVYANKO (Z. S.).] **Головянко (З. С.). Paradichlorobenzene in the Control of the Larvae of** *Polyphylla fullo*, **L., in the Vineyards of the Lower Dnieper Sands.** [*In Russian.*]—8vo, 43 pp., 7 pls., 5 charts. Kiev, Nat. Comiss. Agric., 1927. Price 75 *kop.*

Paradichlorobenzene has proved effective for the control of *Polyphylla fullo*, L., in the vineyards of the lower Dnieper. Other larvae occurring in the soil are also killed. The fumigant must be applied systematically throughout the vineyard; if it is only applied near the plants, the larvae in other parts of the soil will not be reached by the fumes. The paradichlorobenzene should be pounded until the particles are about as fine as common salt. It should be used at the time of planting out the young vines, which should be set at a distance of 21 ins. in rows 7 ft. apart, and the fumigant should be placed in holes 21 ins. apart, the lines of holes being also 21 ins. apart, and so arranged that the holes nearest the plants are 10½ ins. from them. If it should be necessary, owing to the small number of plants available, to space them at a distance of 42 instead of 21 ins., the paradichlorobenzene must still be applied as described to ensure complete fumigation of the entire area. The paradichlorobenzene is applied at the rate of about ¼ oz. to each hole at a depth of about 3½–4 ins. and covered with soil. This applies to sandy soils; in heavier clay soils the dosage should be increased to about ⅓ oz.

Both larvae and pupae are killed by this treatment; oviposition seldom occurs in treated soil, and if eggs are laid, the larvae are killed soon after hatching. The effect of the fumigation lasts throughout the summer and does not injure the young plants. As the older plants usually survive injury by *P. fullo*, it is not considered necessary to repeat the treatment.

When very valuable vines are to be planted, the fumigation may be done 10–14 days before planting, in which case, however, the exact position in which the plants are to be set out should be marked beforehand.

[GORSHKOV (G. N.).] **Горшков (Г. Н.). The Pink Bollworm** (*Pectinophora gossypiella*, **Saund.) in Asia Minor.** [*In Russian.*]—*Khlopkovoe Delo*, vi, no. 11–12, pp. 859–866, 1 map. Moscow, November-December 1927.

In the course of an investigation into the cotton-growing conditions in Asia Minor, with a view to establishing commercial relations between Turkey and Russia, it was found that *Platyedra* (*Pectinophora*) *gossypiella*, Saund., was established in many of the fields. The importance of preventing its spread to the Russian cotton fields by enforcing quarantine regulations is pointed out, and the remedial measures, such as the removal of infested seed after harvest and disinfection before sowing, that are being enforced in Turkey are briefly discussed.

[ZAKHAROV (L. Z.).] **Захаров (Л. З.). The Swamps of the Lower Kuma River as Breeding Places for the Migratory Locust.** [*In Russian.*]—*Bull. N. Caucas. Pl. Prot. Sta.*, no. 3, pp. 3–92, 4 maps, 2 pls., 146 refs. Rostov-on-Don, 1927. (With a Summary in German.)

A detailed account is given of the geography, climate, soil and plants of the areas on the lower Kuma river, which serve as breeding grounds for *Locusta migratoria*, L. The actual places where the eggs are laid by the locusts are not constant; they depend on the level of the river and on the effect of the year's weather on the vegetation, the females ovipositing chiefly in places where their favourite food-plants occur.

The Kuma breeding areas are not isolated, but are often infested by swarms migrating from the lower Terek and from the shores of the Caspian, and a complete suppression of locust invasions is possible only through concerted action in all breeding areas.

[DOVNAR-ZAPOL'SKIĬ (D. P.).] **Довнар-Запольский (Д. П.). A Review of the Acrididae of the North Caucasian Region.** [*In Russian.*]—*Bull. N. Caucas. Pl. Prot. Sta.*, no. 3, pp. 172–196, 1 map, 2 figs., 25 refs. Rostov-on-Don, 1927. (With a Summary in German.)

A list is given of the species of ACRIDIDAE occurring in the North Caucasus, with detailed data on their distribution and ecology.

[ZAKHAROV (L. Z.).] **Захаров (Л. З.). The Question of the Action of Arsenical Preparations in Contact with** *Locusta migratoria*, **L.** [*In Russian.*]—*Bull. N. Caucas. Pl. Prot. Sta.*, no. 3, pp. 197–203. Rostov-on-Don, 1927. (With a Summary in German.)

Experiments to test the contact action of arsenical preparations on *Locusta migratoria*, L., were made in large cages in the open. The poisons were applied either by a hand-bellows or by a brush. Sodium arsenite was shown to have a definite contact action, and its effect was increased by the humidity of the air (dew). Calcium arsenate gave indefinite results. The contact action of Paris green was proved provisionally, but further experiments are necessary. On the whole, the experiments were not considered sufficient for definite conclusions.

[GAVALOV (I. I.).] **Гавалов (И. И.). Contribution to a Knowledge of the Coccidae of the Northern Caucasus.** [*In Russian.*]—*Bull. N. Caucas. Pl. Prot. Sta.*, no. 3, pp. 209–214, 10 refs. Rostov-on-Don, 1927. (With a Summary in German.)

This list of 24 species is the first review of the Coccids occurring in the Northern Caucasus. The local distribution and food-plants are indicated.

[ROMANOVA (V. P.).] **Романова (В. П.). Some Observations on the Melon Fly** (*Carpomyia caucasica*, **Zaitz.) in the Northern Caucasus.** [*In Russian.*]—*Bull. N. Caucas. Pl. Prot. Sta.*, no. 3, pp. 215–224, 1 pl., 4 refs. Rostov-on-Don, 1927. (With a Summary in German.)

As a result of observations in the Northern Caucasus during 1925–27 a short account is given of the seasonal history of *Carpomyia caucasica*, Zaitz., and the injury it causes to melons and water-melons [*cf. R.A.E.*, A, vii, 347]. The chief damage is done by the first generation, owing to the fact that when the adults are ovipositing (about the last week in June), the developing fruits of the late-sown varieties are most suitable for egg laying. The flies do not readily oviposit in the more advanced fruits of the earlier varieties. Melons of a diameter of about 3–5 ins. were not attacked, though neighbouring plots where the fruit had only just set were heavily infested. *Muscina stabulans*, Fall., and *M. assimilis*, Fall., were found in association with *Carpomyia* and also in melons in which this fruit-fly did not occur.

[SAKHAROV (Yu. A.).] **Сахаров (Ю. А.). On the Question of disinfecting Seed Material.** [*In Russian.*]—*Bull. N. Caucas. Pl. Prot. Sta.*, no. 3, pp. 225–227, 1 ref. Rostov-on-Don, 1927.

The effect of fumigation on the germination of seed varies even among different varieties of one species of plant. The observations described were carried out in a store containing 360,000 lb. of seed, which was infested by various insects, including *Plodia interpunctella*, Hb., *Tenebrio molitor*, L., *T. obscurus*, F., *Sitodrepa panicea*, L., and *Ptinus fur*, L. Carbon bisulphide was applied at the rate of about 5½ lb. to 700 cu. ft. of space for a period of 45 hours, after which a careful search revealed no living insects. Samples of different varieties of cabbage and cauliflower seeds were tested after fumigation and compared with samples taken before fumigation. In 3 samples the power of germination was unaltered, in 17 it was raised, and in 19 it was lowered. The increase in germination amounted to as much as 9·5 per cent. in some cases, and the decrease to 9 per cent. The variation in the reaction of the same varieties may be due to factors that have not yet been studied, but the results indicate that no serious injury to the seed is caused under ordinary conditions of fumigation with carbon bisulphide.

All cracks, windows and doors were sealed with calcium sulphate and lime instead of the more usual clay.

Brief Notes. [*In Russian.*]—*Bull. N. Caucas. Pl. Prot. Sta.*, no. 3, pp. 228–229. Rostov-on-Don, 1927.

It is reported by Yu. Sakharov that considerable injury has been caused to timber in the Northern Caucasus by *Hylotrupes bajulus*, L., and *Rhyncolus culinaris*, Germ., the latter being particularly injurious to floor boards, making them unfit for use. Fumigation with carbon bisulphide is to be undertaken as soon as the weather conditions are suitable.

In fumigating stored products, a mixture of calcium sulphate and lime has been found to be more effective for closing crevices, etc., as this substance does not crack so easily in hot weather as clay, which is generally used.

The following notes are by M. Timofeev: The locusts, *Calliptamus italicus*, L., and *Dociostaurus maroccanus*, Thunb., have increased considerably; according to data for 1928, the infested area amounts to over 2,400 acres. Grasshoppers have also been increasing; the species concerned are *Decticus verrucivorus*, L., *Pholidoptera indistincta*, Bol., *Tettigonia caudata*, Charp., and *T. viridissima*, L.

[VINOKUROV (G. M.).] **Винокуров (Г. М.). Grasshoppers and the Areas of their Mass Occurrence in Eastern Siberia. Preliminary Note.** [*In Russian.*]—*Bull. Irkutsk Pl. Prot. Sta.*, no. 1, pp. 3–52, 16 refs. Irkutsk, 1927. (With a Summary in English.)

Grasshoppers in Eastern Siberia are of exceptional economic importance, the history of their outbreaks dating as far back as 1726. The main areas subject to outbreaks are reviewed for a series of years in order to define the breeding regions, which should be kept under observation. A full list of the ACRIDIDAE of Eastern Siberia is given, with data on their distribution, ecology and phenology. The principal injurious species are *Gomphocerus sibiricus*, L., *Chorthippus albomarginatus*, DeG., *C.* (*Stauroderus*) *scalaris*, F.W., and *C.* (*S.*) *biguttulus*, L., while in certain areas *C.* (*S.*) *hammerstroemi*, Miram, *Arcyptera fusca*, Pall., *Podisma pedestris*, L., and *Prumna primnoa*, F.W., also appear occasionally in large numbers. Grasshopper outbreaks in E. Siberia have a periodicity of about 5–6 years, but the years of the greatest damage to crops do not always coincide with the greatest increase in the numbers of grasshoppers, since the extent of the damage depends very largely on the state of the wild grassland. In years when grasses dry up early, the grasshoppers migrate to the cultivated crops and do great damage.

Parasites observed in E. Siberia include *Epicauta megalocephala*, Gebl., but the areas of mass appearance of this beetle do not always correspond to the main grasshopper areas, and it is doubtful whether it is always parasitic only in the egg-pods of grasshoppers. A Scelionid has been bred from the eggs of *C. scalaris* and *C.* (*S.*) *apricarius*, L., up to 60 per cent. of the egg-pods being infested. The parasite lays its eggs in grasshopper eggs singly when the latter are being deposited, being attracted by the frothy substance emitted by the ovipositing grasshopper. The fungus, *Trichoderma lignorum*, has been found in the egg-pods of *Arcyptera fusca*, while adults of *Chorthippus scalaris* are attacked by *Empusa grylli*. *Fusarium acridiorum* was found on some individuals of *Chorthippus albomarginatus* that died from a disease, but not on all of them. Dipterous parasites of the grasshoppers include *Blaesoxipha lineata*, Fall. (bred from *Gomphocerus sibiricus*), *B. rossica*, Vill. (from *Omocestus haemorrhoidalis*, Charp.), *Blaesoxiphella brevicornis*, Ill., and *Sarcophila latifrons*, Fall. A hyperparasite, *Brachymeria* (*Chalcis*) *dalmani*, Thoms. (*femorata*, Dalm.), has been observed ovipositing in grasshoppers infested with Dipterous larvae.

[FRENKEL' (K. L.).] **Френкель (К. Л.). Cutworms as Pests of Vegetables in the Irkutsk Area.** [*In Russian.*]—*Bull. Irkutsk Pl. Prot. Sta.*, no. 1, pp. 53–65, 15 refs. Irkutsk, 1927. (With a Summary in English.)

Cutworms cause a considerable amount of injury to vegetable crops in Irkutsk. The species recorded during 1926 were *Euxoa* (*Agrotis*) *islandica*, Stgr. (80 per cent. of the total number collected), *E.* (*A.*) *adumbrata*, Ev., *E.* (*A.*) *cursoria*, Hufn., *E. cursoria* var. *vaga*, Stgr., and *Agrotis ditrapezium*, Bkh. A general account is given of the various stages, and the seasonal history of the individual species is discussed.

From about 22 per cent. of the cutworms examined, the following parasites were reared : The Chalcid, *Litomastix* (*Copidosoma*) *truncatella*, Dalm., the Braconid, *Microplitis eremita*, Reinh., and the Ichneumonid, *Amblyteles erythrocephalus*, Meyer.

Field experiments with poison baits were inconclusive owing to rain, but it was found that watering with carbolic acid emulsion or a weak kerosene emulsion made the cutworms appear on the surface in 3–5 minutes, though it did not kill them.

[Vinokurov (G. M.).] **Винокуров (Г. М.). Larvae of the Lucerne or Flax Noctuid** (*Chloridea* (*Heliothis*) *dipsacea*, **L.) as a Pest of Grain in the Ear.** [*In Russian.*]—*Bull. Irkutsk Pl. Prot. Sta.*, no. 1, pp. 67–79, 2 refs. Irkutsk, 1927.

During 1922 considerable injury was done in Irkutsk to the ears of cereals by *Heliothis* (*Chloridea*) *dipsacea*, L. Details are given of the amount of injury in various localities ; it amounted to as much as 80 per cent. on rye in one case. The young larvae feed on weeds, but later crawl up the stems and feed on the grain of almost any cereal crop, spring sown rye being particularly attractive. Hemp is also attacked. A list of 24 food-plants of the larvae is given. In 1923 the larvae were first noticed in the field on 9th July, the larval stage lasting 20–25 days. They pupate in August and September, and as only pupae are found in the early spring, it is assumed that the winter is passed in this stage. Pupation occurs mainly in the ground at a depth of about 2½–4 inches, but sometimes (in wet weather) on the surface of the soil or in the sheaves, etc. The first adults were observed on 6th June, the maximum flight occurring between 20th June and 29th July. The eggs are laid on the leaves of various weeds, from which the larvae eventually migrate to the grain crops. The destruction of weeds considerably reduces the possibility of infestation and should be done before oviposition begins. The eggs hatch in 3–5 days.

During 1923 the larvae of *H. dipsacea* were heavily parasitised. Apparently these parasites, which have not been determined, and a fungus have controlled the pest, as it has not since been recorded as injurious.

Poison baits were not satisfactory when applied in very damp weather following rains, but during a dry period all larvae were killed after about two days. The bait consisted of 40 lb. bran, 2 lb. sodium arsenite and 3 gals. hot water, and was scattered amongst spring sown rye at 5 o'clock in the evening over an area of ¾ acre. It remained moist for 4 days. The same results were obtained by using half bran and half sawdust, but when the latter was used alone some of the larvae were not killed. The larvae may be dislodged from the ears by dragging a rope over them.

Insect Key. [*In Russian.*]—8vo, viii + 943 pp., 118 figs., 1 map. Moscow, Novaya Derevnya [New Village], 1928. Price 12 *r.*

This is a key to the more important insect pests of European Russia compiled by various entomologists and edited by I. N. Filip'ev. The structure, development, distribution and classification of insects are discussed generally, and instructions are given for the preparation of specimens. Keys are given to the orders, families, genera and species of the adults, and to the orders (and in some cases further) of the larvae.

[Cholodkovskiĭ (N. A.).] **Холодковский (Н. А.). A Course of Theoretical and Applied Entomology. Vol.** i. [*In Russian.*]—8vo, viii + 432 pp., 367 figs., numerous refs. Moscow, Govt. Publ., 1927. Price 7 *r.* 50 *k.*

As the author was unable to complete the revision of this 4th edition of his work before his death, the various chapters have been brought up to date by different specialists.

The general anatomy, morphology, classification and geographical distribution of insects are dealt with at length, and their biology and economic importance are also discussed. The last chapter, which occupies a little more than a third of the entire work, is devoted to the control of agricultural and forest pests, and is subdivided under the headings of biological control, and cultural, mechanical and chemical measures.

GEMMILL (J. F.). **On the Life-history and Bionomics of the Wheat Bulb Fly** (*Leptohylemyia coarctata*, **Fall.**).—*Proc. R. Phys. Soc. Edinb.*, xxi, pt. 3, pp. 133–158, 7 figs., 6 refs. Edinburgh, 1927.

Apart from slight variations in the dates of emergence of the various stages, the information here given on the bionomics and control of *Hylemyia* (*Leptohylemyia*) *coarctata*, Fall. (wheat bulb fly) is similar to that previously recorded [*R.A.E.*, A, xi, 566, etc.]. *H. coarctata* is widely though unevenly distributed and is most abundant in areas where wheat is grown following potatoes, especially early potatoes. The fields most severely infested are those in which the previous year's root crop or fallow was close to infested wheat fields ; areas in which there are widely scattered fields of potatoes or much pasture, or a large proportion of cereals other than wheat, are relatively free. A field may be considered badly infested when the soil contains over 500,000 eggs to an acre during November ; during spring, the wheat fields have 300,000 to 750,000 infested stalks to an acre, and about the middle of July, 25 to 50 per cent. of the Diptera obtained by netting are of this species. Tables are given showing the degrees of larval infestation of wheat following potatoes and of various cereals in other types of rotation.

On emergence the flies are sexually immature, and do not oviposit for some weeks. The eggs are laid singly wherever there is bare, loose soil, about 50 being laid by each individual. Newly laid eggs can sometimes be seen on the surface of the soil, but are more often invisible until the soil is shaken up. Methods of rearing the flies in the laboratory are described ; they were not attracted by young wheat but fed on *Myosotis*. Better results were, however, obtained when they were fed on a thin jelly consisting of sugar, plasmon, gelatine and Ringer's solution. On hatching the larvae bore into the wheat plant from the soil, and in 3 to 4 days the centre leaf shows signs of withering, but the roots, the seed and the bulb are not affected. Infestation stimulates the production of lateral shoots in vigorous plants, but unless this happens the whole plant dies in 12 to 15 days, and the larvae attack another plant. If the plants are small, as many as four may be attacked by a single larva. The distance a larva can travel from the place of hatching is probably not more than 2 ft. in a direct line.

The food-plants of *H. coarctata* are discussed, and experiments in which larvae were kept in tubes with different plants are described. In a particular case a newly hatched larva was placed with wheat on 4th February, and the wheat became infested ; after 23 days it was removed to barley, which also became infested ; after 13 days it was removed to oats, which were not infested ; 4 days later, it was recovered from the soil and kept with barley, which was once more infested ; finally, after 6 days it was removed to wheat, and in 7 days it had pupated in the soil.

Other pests infesting wheat are wireworms and *Bibio lacteipennis*, Zett., the larvae of which were found to exist in great numbers in certain fields, where they primarily feed on the organic substances present in the soil, though they also attack young wheat plants, causing an injury similar to that caused by wireworms. *B. lacteipennis* is responsible for very serious thinning out in young wheat fields and probably also attacks other cereals. It may develop into a dangerous enemy of wheat, though it has not adapted itself to the customary crop rotation so successfully as *H. coarctata*.

VON TUBEUF (G.). **Reichspflanzenschutzgesetz.** [Legislation for the Protection of Plants in Germany.]—*Z. PflKrankh.*, xxxviii, no. 3–4, pp. 65–70. Stuttgart, 1928.

After pointing out the disadvantages that arise from the fact that existing laws for plant protection refer to individual pests, it is urged that a general law for plant protection in Germany is required, one of the main provisions of which must be the prohibition, subject to certain exceptions, of the importation of plants with their roots.

TEODORO (G.). **Su due cocciniglie che attacano il gelso nelle isole Egee.** [Two Coccids attacking the Mulberry in the Aegean Islands.]—*Annu. Staz. bacol. sper. Padova*, xlv, pp. 79–80. Padua, 1927.

Aspidiotus rapax, Comst. (*Hemiberlesia camelliae*, Sign.) occurs on mulberry [*Morus alba*] and oleander in Rhodes. It appears to have two generations a year and to be kept down by an endophagous parasite. *A. hederae*, Vall., attacks mulberry on a neighbouring island, where all stages occur throughout the year.

FEYTAUD (J.). **Les guêpes.**—*Bull. Soc. Zool. agric.*, xxvi, nos. 9–10, pp. 129–137, 145–153, 5 figs. Bordeaux, 1927.

This account of wasps occurring in France deals with their biology, habits and control, distinguishing characteristics being indicated for 7 species of the genus *Vespa* and for *Polistes gallicus*, L. *V. vulgaris*, L., *V. germanica*, F., and *V. crabro*, L., are said to be extremely injurious in orchards and vineyards, the latter also attacking hives and killing the bees, while *V. rufa*, L., *V. saxonica*, F., and *V. silvestris*, Scop., rarely attack fruit, and *V. media*, DeG., and *P. gallicus* do not cause serious damage. Wasps attack many beneficial insects as well as several that are either unimportant or injurious, so that their economic position remains undefined.

RAYMOND (G.). **Contribution à l'étude des cécidomyes attaquant les violettes cultivées.**—*Ann. Soc. linn. Lyon*, lxiii (1926–27), pp. 87–101, 16 figs. Lyons, 1928.

Whole fields of cultivated violets near Grasse are seriously damaged by galls formed by *Dasyneura* (*Perrisia*) *affinis*, Kieff., and by a new Cecidomyiid, *Cottia violarum*, gen. et sp. n. The biology of the two insects is similar. The eggs are laid on the edges of the leaves, which at once begin to curl. The larvae of the final summer generation spin cocoons, the larger containing females and the smaller males, in September–October, but they do not pupate till March, the adults of the first generation appearing shortly after. There are several generations a year, the life-cycle from egg to adult occupying about 60 days. Reproduction may be parthenogenetic or sexual, and it is possible that the larvae are paedogenetic.

The only method of control is to collect and burn all leaves attacked at the beginning of winter.

ROUBAUD (E.). **L'anhydrobiose réactivante dans le cycle évolutif de la pyrale du maïs.**—*C.R. Acad. Sci. Fr.*, clxxxvi, no. 12, pp. 792–793. Paris, 1928.

Pyrausta nubilalis, Hb., has sometimes one, sometimes two generations a year, both in America and in Europe, and in both cases hibernation occurs in the fifth larval instar. The length of hibernation is not dependent on temperature alone ; without moisture the larva cannot pupate. Hibernating larvae placed in a completely dry atmosphere cease to develop, and only continue to do so in the presence of moisture. If the length of time without moisture, however, has not been long enough, the rehydrated larvae soon return to a torpid condition in spite of warmth and damp, do not pupate and eventually die. On the other hand pupation and emergence occur the more quickly and with fewer failures the longer and more severe the drying to which the larvae have been submitted before damping. The forced rest imposed by anhydrobiosis allows the larvae to acquire slowly the energy necessary for development, which can then take place under the influence of moisture. The reactivating effects of anhydrobiosis may be supplemented in the winter cycle by those of their physiological equivalent, prolonged athermobiosis. Larvae kept at a low temperature for several months, without being exposed to drying, have been able to continue development. But in the summer cycle of the insect with two annual generations, it is the drying that is indispensable. Thanks to summer drying experienced by the larvae in an advanced state of development in the dry stubble of the food-plants in July and August, the cycle can be resumed with damp in September, and thus make possible a second generation. The question of two generations of the insect, therefore, depends on the intervention at the right time of a warm, dry aestivation period, followed by a fairly long, warm and damp period.

SASAKI (C.). *Tyroglyphus muscae*, **a Mite infesting** *Sturmia sericariae*, **a Fly noxious to the Silkworm.**—*J. Coll. Agric. Tokyo*, ix, no. 3, pp. 151–158, 1 pl., 3 refs. Tokyo, 30th August 1927.

Some further observations on *Tyroglyphus muscae*, which infests *Sturmia sericariae*, a Tachinid parasitic on silkworms [*R.A.E.*, A, xii, 350], are recorded. Descriptions are given of all the stages. More than 100 eggs may be laid by one female under favourable conditions, and these hatch in about 5 days. The mite passes through four stages, which are described, each lasting about 24 hours. It thrives best in dark, damp places and can live for two days wholly submerged in water, but under dry conditions it dies within 2 or 3 days. Experiments are described which show that, besides attacking the parasite, the mite attacks the silkworm itself, and although capable of infesting both pupa and adult, appears especially to attack the larva at the time of moulting, when it is inactive. The silkworm becomes sickly and eventually dies.

KUWANA (I.). **On the Genus *Bemisia* (Family Aleyrodidae) found in Japan, with Description of new Species.**—*Annot. zool. jap.*, xi, no. 3, pp. 245–253, 3 figs., 1 pl. Tokyo, November 1927.

The following species of the genus *Bemisia*, the pupa-cases of which are described with a key, are known to occur in Japan: *B. giffardi*, Kotinsky, on the lower surface of leaves of *Citrus*; *B. shinanoensis*, Kuw., on mulberry (*Morus alba*); and *B. myricae*, sp. n., on both sides of the leaves of *Myrica rubra*, mulberry, *Citrus* and other plants. This whitefly passes the winter in the immature stage on leaves of *M. rubra* and *Citrus*. It becomes mature in the latter part of May and flies to mulberry fields, where it breeds during the summer, returning to its winter food-plants before the mulberry leaves fall in the autumn. *B. shinanoensis* and *B. myricae* cause considerable damage to mulberry trees.

[CORBETT (G. H.).]. **Insect Pests of the Oil Palm in Malaya.**—*Malayan Agric. J.*, xv, no. 9–10, pp. 338–342, 2 pls. Kuala Lumpur, September–October 1927.

The insects occurring on the oil palm (*Elaeis guineënsis*) in Malaya do not cause damage of much importance, and it has proved far less liable to insect attack than the coconut palm. The most dangerous pest is *Rhynchophorus schach*, Oliv. (red-stripe weevil) [*R.A.E.*, A, xi, 389], which having once gained an entry into the tree, invariably kills it. It may, however, be successfully controlled by taking care to prevent the injury to the palm by attacks of the adults of *Oryctes rhinoceros*, L., and careless pruning, and by carefully dressing all the wounded surfaces and practising estate sanitation. The breeding grounds of *O. rhinoceros* should be destroyed, and the pruned ends of leaf stalks and any accidental wounds should be tarred to prevent egg-laying by *R. schach*, the larvae of which have been known to bore through 15 ins. of leaf-stalk and to enter the trunk; they also breed in recently felled palms of various species, so that all these should be burnt within 2 months of felling. The adults of *Oryctes rhinoceros* have not caused fatal injury to oil palms up to the present. The eggs are laid in decaying matter of all kinds and hatch in 10 to 18 days; the larvae feed on the refuse, pupating there after about three months and emerging as adults about a month later. Although the larvae have not yet been found in the refuse heaps on oil palm estates, these should be inspected and if necessary cleared away.

The leaves of the palms are occasionally attacked by the larvae of the Pyschid, *Mahasena* sp. The larvae live in cases composed of leaves, and the wingless females lay their eggs in the cases. The control of the larvae on coconut palms has been carried out by spraying with lead arsenate, 2 lb. to 50 gals. water, and the use of sticky bands to prevent the larvae, which are sometimes beaten to the ground in hundreds by rain and wind, from returning to the trees. *Valanga nigricornis*, Burm. (short-horned grasshopper) has several times been recorded on very young palms, particularly where a cover crop of giant mimosa (*Mimosa invisa*) is growing; where this has occurred the removal of the cover crop has brought about the disappearance of the insect. Oil palms are also attacked by *Coptotermes gestroi*, Wasm., which is always liable to cause injury unless the land is kept clear of all timber.

Apart from these pests, a list is given of 21 insects recorded on the oil palm, but not doing any serious injury. The only ones likely to be of any importance in the future are *Setora nitens*, Wlk., and *Erionota* (*Hidari*) *thrax*, L., which occasionally cause considerable damage to coconut palms.

MUNRO (D. G.). **Coffee Berry Borer,** *Stephanoderes hampei* **(Ferr.).**—*Plant. Chron.*, xxii, no. 39, pp. 563–570. Madras, 24th September 1927.

An account is given of the biology of *Stephanoderes hampei*, Ferr. (coffee berry borer) in Java, compiled from the literature, in view of the possibility of its being introduced into South India, and the various means by which it may be spread are discussed. In most of South India, owing to the fact that there is only one crop a year, the beetle would have little food or opportunity for breeding during about six months, but it is possible that alternative food-plants might be found. Coffee seed is considered to be important in the spread of the beetle, and its importation into India is already restricted. It is important to discover if the borer is carried in market coffee, in which case the importation of raw coffee should be prohibited.

HEGDEKATTI (R. M.). **The Rice Gall Midge in North Kanara.**—*Agric. J. India*, xxii, pt. 6, pp. 461–463, 1 ref. Calcutta, November 1927.

Very serious damage was caused in 1925 by the gall-midge, *Pachydiplosis oryzae*, Wood-Mason, in the Bombay rice-growing areas of Konkan and Northern Kanara, over 25 per cent. of the plants being attacked. This midge is known as a pest of rice in many parts of India, and though it does not appear to have been recorded as causing injury in these districts, the local growers state that serious damage was due to it in 1917, 1918, 1919 and 1922. No damage was reported in 1926 except to a few plants in one locality. Records in one of the infested localities show that exceptionally heavy rainfall occurred in May in the years when damage was most serious, except in 1919 when the temperature was unusually low. Early-sown crops are much less subject to attack than those sown later, and damage to sprouted seeds sown for late transplantation was always more serious. Local varieties were much less attacked than those introduced from other districts. Damage becomes obvious in seed-beds about the first week in July, whilst in the field it is most noticeable in August in plants transplanted 20–25 days previously. The midge remains active until harvest, and continues to attack small shoots until the middle of December. The winter rice crop, which is grown from sprouted seed sown in puddled fields in November or early December, was attacked in 1925–26 to a small extent, damage appearing up to the end of January.

A similar attack by unidentified gall-midges was noticed in two grasses in paddy fields, namely, *Ischaemum ciliare* and *Eleusine indica*. The only control measures at present applied are the use of early varieties, which, however, do not afford the highest yield, and transplanting at as early a date as possible.

HUTSON (J. C.). **Report of the Entomological Division.**—*Ceylon Adm. Rep. Agric. 1926*, pp.D20–D22. Colombo, October 1927.

Pests in Ceylon during 1926 that have not been recorded in recent years [*R.A.E.*, A, xiv, 39, 556; xv, 218–220, etc.] include: *Saissetia nigra*, Nietn., and *Comocritis pieria*, Meyr., on rubber; *Suastus gremius*, F., on coconut; *Paralecanium expansum*, Green, on nutmeg (*Myristica fragans*); *Chilo simplex*, Butl., on sugar-cane; *Taragama dorsalis*, Wlk., *Coptops aedificator*, F., and *Arbela quadrinotata*, Wlk., on dadap (*Erythrina*); *Eupterote geminata*, Wlk., which generally attacks dadap, on *Albizzia*; *Ceroplastodes cajani*, Mask., and *Icerya purchasi*, Mask., on *Tephrosia candida*; the Tineid, *Cyphosticha coerulea*, Meyr., *Pagria signata*, Motsch., and *Lampides* (*Polyommatus*) *baetica*, L., on *Vigna oligosperma*; the Chrysomelids, *Aulacophora abdominalis*, F., *A. atripennis*, F., and *A. nigripeta*, Duviv., on various curcubits; *Crocidolomia binotalis*, Zell., on radish; *Plutella maculipennis*, Curt., on mustard; *Euzophera perticella*, Rag., on brinjal (*Solanum melongena*); and *Cadamustus typicus*, Dist., on plantain (*Musa sapientum*).

Experiments in connection with the control of *Agromyza phaseoli*, Coq. (bean fly) showed that two varieties of bean appear to be practically immune from attack, whereas two others have been so heavily infested that they have been exterminated. Experiments with *Carpophilus humeralis*, L., and *C. dimidiatus*, F., attacking copra [*R.A.E.*, A, xiv, 556] indicate that fumigation with calcium cyanide may prove to be a suitable means of control.

HARGREAVES (E.). **Report on the Entomological Section.**—*Rep. Lands & Forests Dept. Sierra Leone 1926*, pp. 21–27. Freetown, 1927.

Practically all the information contained in this report has been noticed from another source [*R.A.E.*, A, xvi, 244]. The Coccid infesting the rhizomes of ginger has since been identified as *Aspidiotus harti*, Ckll.

SCHOUTEDEN (H.). **Le Pink Boll Worm au Congo.**—*Agric. & Elevage Congo belge*, ii, no. 1, pp. 1–2. Brussels, 14th January 1928.

Platyedra gossypiella, Saund. (pink bollworm) has recently been found to be established in the extreme east of the Belgian Congo, in the Rusisi valley. The importance of preventing its further spread, and the necessity of quarantine measures, including fumigation of cotton seed both before and after transport, are pointed out.

MUNRO (H. K.). **Biological Notes on the South African Trypaneidae (Trypetidae: Fruit-flies). II.**—*Ent. Mem. S. Afr. Dept. Agric.*, no. 5, pp. 17–40. Pretoria, 1926.

This paper, which is a continuation of one already noticed [*R.A.E.*, A, xiii, 525], contains a list of 56 fruit-flies, most of which were recorded in the previous paper. In addition to further observations on the life-history and occurrence of the flies, notes are recorded on their colours, particularly on the colours of the eyes in life. An additional table of the food-plants of various species is given.

HAINES (G. C.). **Entomological Notes, no. 35. The Fig Curculio.**—*Fmg. S. Afr.*, reprint 3 pp., 6 figs. Pretoria, April 1927.

Many of the notes here given on the life history and control of *Omophorus stomachosus*, Boh. (fig weevil) have already been noticed [*R.A.E.*, A, xi, 239]; arsenical sprays have not been sufficiently tested to be recommended, but handpicking of the adults is practicable, and the removal of leaves and branches from beneath the fig trees in the autumn will deprive the beetles of hibernating quarters. The infested portions of the figs are conspicuous as blackened spots plugged with gummy matter, and nearly ripe figs, where the egg-pits are fresh, may be eaten if these are cut out.

Entomological Notes, no. 36.—*Fmg. S. Afr.*, reprint 3 pp. Pretoria, May 1927.

Experiments in connection with the control of the maize stalk borer [*Busseola fusca*, Fuller] made with young maize plants have shown that considerable scorching by some chemicals has no appreciable effect on the yield of maize, while diluted at the rate of 1 to 200 a sheep dip [the one containing derris, *R.A.E.*, A, xv, 334] has been found to be quite safe. In February and March it was noted that the second generation moths show a decided preference for young maize, where maize only is grown, and for amber cane where this is grown; this generation does considerable damage to the cobs of the younger maize, and plants in which the male flower has not yet appeared were preferred for oviposition.

A Hymenopterous egg-parasite of the eucalyptus snout-beetle [*Gonipterus scutellatus*, Gyll.], recently introduced from Australia, appears to have become firmly established, the rate of parasitism having sometimes been as high as 38 per cent., while over 12,000 individuals have been recovered. To assure of their protection from the winter in the high veldt some have been liberated at places below the frost line.

Sweetened poison baits used for the trapping of the false codling moth [*Argyroploce leucotreta*, Meyr.] caught several species of fruit-moths and Cetoniid fruit-beetles, and it is thought that this bait may prove effective against pests attacking ripe and ripening fruit during the summer.

Records show that the emergence of the red bollworm [*Diparopsis castanea*, Hmps.] occurs throughout the year, except in the winter season; some individuals remain in the soil in pupation for 21 months, and others go into pupation in the autumn and do not emerge until February or March, which would explain the occasional severity of autumn infestations. Of over 77,000 bollworm moths caught in one locality less than half were *D. castanea*, but this pest has, nevertheless, steadily increased, the percentage of infestation ranging from 3 to 15 in another district during March. Ratoon cotton was severely attacked by the cotton Jassid [*Empoasca facialis*, Jac.], which increased greatly during March. Cotton is not attacked by *Laphygma exempta*, Wlk. (mystery worm), even in places where it has defoliated the other available plants.

All stages of the bean bug [*Acanthomia tomentosicollis*, Stål] can be controlled by spraying [*R.A.E.*, A, xv, 327], or by placing fresh bean plants dipped in a sweetened poison bait, consisting of sodium arsenite, sugar and water, between the rows of beans.

A new pollard fruit-fly bait contains sodium arsenate at the rate of $\frac{1}{5}$ lb. to 10 gals. water ; it kills fruit-flies after 6 to 9 hours, and is highly satisfactory. An efficient type of container has not yet been perfected ; the amount of light reflected from the surface and the light intensity of the interior are important factors, and white appears to be more attractive to the flies than black. Experiments made with canvas bags for containing the bait seem to be promising.

PETTEY (F. W.). **Entomological Notes, no. 37. Control of Codling Moth. Subduing the Pest and Removing Spray Residue.**—*Fmg. S. Afr.*, reprint 7 pp. Pretoria, July 1927.

During 1927 laboratory and field experiments were made on the control of the codling moth [*Cydia pomonella*, L.] on pears. In the orchard where lead arsenate sprays were tested, no supplementary measures were carried out except the banding of trees for trapping larvae. In all spray programmes used, the first application was made when half or all the petals had dropped, and the second when all had dropped, or two weeks later if the variety blossomed early. The third and fourth sprays were applied at intervals of two weeks. A programme of four sprays of normal concentration (1¼ lb. standard lead arsenate powder in 40 gals. water) confined to pears harvested no later than the third week in February, with an interval of 7–10 weeks between the last spray and the date of harvesting, reduced the amount of arsenic retained by the fruit to approximately 0·01 grain per lb. or less, but in some cases did not control the infestation satisfactorily. A five-spray programme of normal concentration for late maturing varieties, with an interval of 7–9 weeks before harvesting, gave the same results, thus indicating that supplementary measures would be necessary if this programme for late maturing pears and apples were to be satisfactory, particularly during seasons of light crops. A four-spray programme of double normal strength (2½ lb. lead arsenate powder in 40 gals. water), with an interval of 9–11 weeks between the last spraying and the date of harvesting, and a five-spray programme for late maturing varieties in which the first three or four applications were of double normal strength, and the last at the rate of 1 lb. lead arsenate powder to 40 gals. with an interval of 7–9 weeks between the last spray and harvesting, both gave satisfactory control, but would necessitate treatment for the removal of arsenic. The usual full programme of normal strength sprays [five for early ripening and seven for late ripening varieties] resulted in an arsenic residue of three to six times the British tolerance (0·01 grain per lb.). In planning programmes when no treatment for the removal of arsenic residue is contemplated, it should be borne in mind that there is more arsenic to a pound of fruit in small pears than large ones. The addition of calcium caseinate spreader did not appreciably affect the methods of removal of spray residue, nor did it improve the efficiency of the lead arsenate [*R.A.E.*, A, xv, 21]. A 3 per cent. solution of summer oil spray was found to be effective against the eggs of *C. pomonella.* A solution of 3 per cent. of the oil with lead arsenate at normal strength gave better control than a similar programme with the oil omitted, but the oil considerably retarded the removal of arsenical residues and added greatly to the expense of the sprays. Neither heavy rain nor spraying pears on the trees with water at 200 lb. pressure appreciably reduced the amount of arsenic retained by the fruit, nor was it greatly affected by the roughness or smoothness of the skin of the pears.

Tests showed that dry wiping, dry brushing, brushing the calyx and wiping with a wet cloth, or washing with water and with solutions of hydrochloric acid at a concentration of less than ½ per cent. actual HCl, would not be sufficiently effective for reducing the arsenical residue to the tolerated amount if a full or heavy spray programme were adopted. A method of dipping the fruit, placed in a large straw basket, up and down for two minutes in a solution of 1–2 per cent. actual hydrochloric acid (*i.e.*, about 1 measure of commercial HCl in 15–30 of water) and rinsing in clean water, afterwards allowing the pears to drain for 15 minutes in trays, gave satisfactory results and the keeping quality of the pears was not affected, but the method cannot be recommended for all conditions until tests have been made on several varieties of pears and in soft and hard water.

No effective substitute for lead arsenate sprays has been found. Sprinkling the foliage and fruit with a mixture of treacle, water and lead arsenate once a fortnight as used against fruit-flies resulted in a very heavy infestation, while spraying with a mixture of treacle and lead arsenate not only decreased the efficiency of the lead arsenate, but resulted in serious spotting of the fruit. Baits of fermenting wine or apple juice were unsatisfactory. Five applications of lead chromate at the rate of 6 lb. paste in 40 gals. water with caseinate spreader were not very effective, while one application of sodium silicofluoride (2 lb. sodium silicofluoride powder and 2 lb. unslaked lime in 40 gals. water) caused such severe scorching of leaves and fruit that the test was abandoned. The fact that about 80 per cent. of the infestations in the sprayed fruit occurred at the point where one fruit touched another may explain why double strength sprays are not more effective. Limited tests suggest that a spray programme of four or five sprays, the first two of normal concentration and the third and fourth of double strength, would give as satisfactory results as a full spray programme of seven applications of normal strength lead arsenate. Such a programme would decrease the cost of control, and should be further investigated under other conditions. Where supplementary measures are not used, there is no alternative but to spray thoroughly once every 3 weeks after the first two sprays with normal concentration of lead arsenate until the crop is harvested and then to treat for effective removal of arsenic. Supplementary control measures and co-operation of neighbouring fruit growers are necessary if the last two sprays of such a programme are to be omitted.

FULLER (C.). **White Ants and Control Measures.**—*Fmg. S. Afr.*, reprint no. 48, 3 pp. Pretoria, December 1927.

This is a general review of measures against termites, including the treatment of wood and the protection of field crops by fumigating the nests.

COPEMAN (P. R. v. d. R.). **Some Effects due to the Spraying of Fruits.**—*S. Afr. J. Sci.*, xxiv, pp. 198–203. Johannesberg, December 1927.

It has been found [*R.A.E.*, A, xiii, 614] that there is a marked decrease in the acidity of sprayed oranges, which is mainly accountable for a deterioration in their flavour. Analyses were made of sprayed and unsprayed fruits, and tables are given illustrating the results. The first was made of a consignment of oranges, some of which had been sprayed with a solution of 4 gals. water and 1–1½ oz. lead arsenate, and others of which had been left as controls ; the decrease in acidity was significant and is apparently dependent on the amount of spray used. Spraying does not affect the total sugar content of the juice, but the ratio of sucrose to the total amount of sugar was found to diminish. It is thought that spraying disturbs the equilibrium existing between sucrose and invert sugar in juice, but since the total sugar content is not affected it would seem that the sucrose becomes converted into invert sugar. In normal oranges sucrose forms practically 50 per cent. of the total amount of sugar, and its diminution would contribute in some way to the characteristically insipid flavour of sprayed oranges. A number of oranges sprayed with 40 per cent. nicotine sulphate did not suffer in any way, and it has been found that the deleterious effect is due only to arsenical sprays. It is apparent that the effect of spraying is general and that the spray is absorbed through the leaves rather than through the rind of the fruit ; the fact that all the oranges on the tree are affected in the same way confirms this view, and from various observations made, it may be concluded that the effect of the spray persists for at least two seasons. Analyses were also made of consignments of apples and pears, and tables are given showing the effect of the spraying on the acidity and sugar, but although a change does occur, the effect of spraying pears and apples with lead arsenate can be ignored, since no difference can be detected by the palate between the sprayed and unsprayed fruit.

ANDERSON (T. J.). **Annual Report of the Entomologist.**—*Rep. Dept. Agric. Kenya 1926*, pp. 135–147. Nairobi, 1927.

In addition to pests recorded in recent years from Kenya [*R.A.E.*, A, xiii, 76, 553 ; xiv, 552–553], various others are noted in this report. The mealybugs recorded on coffee are *Ferrisia virgata*, Ckll., *Pseudococcus perniciosus*, Newst. & Will., *P. citri*, Risso, *P. lilacinus*, Ckll., and two other species, possibly *P. comstocki*, Kuw., and *P. adonidum*, L. (*longispinus*, Targ.). All the mealybugs attacking the roots of coffee have been identified as *P. citri*, which has not been recorded on the aerial parts of the plant, and it is hoped that this species has now been exterminated. The ants, *Paratrechina jaegerskjoeldi*, Mayr, and *Acantholepis capensis*, Mayr, have been found associated with it. The other species appear to be of minor importance, with the exception of *P. lilacinus*, which is the mealybug formerly thought to be *P. citri*. In certain districts the ants, *Technomyrmex albipes*, Smith, and *Pheidole speculifera*, Em., are associated with it, but it is controlled by natural enemies unless attended by *Pheidole punctulata*, Mayr. Measures against both ants and mealybugs are discussed [see next paper]. The breeding and distribution of the ladybird, *Cryptolaemus* [*montrouzieri*, Muls.], has now been discontinued, as it was found that it was destroyed by ants 3 or 4 days after being liberated.

Severe injury is done to the leaves of coffee by *Metadrepana andersoni*, Tams. The larval stage of this moth lasts on an average 22 days, and the life-cycle from egg to egg about 50 days ; in the laboratory reproduction was continuous throughout the year. This pest may be controlled by spraying with 4 lb. lead arsenate to 100 gals. water, or by hand picking the larvae. The leaves are also attacked by *Odites* *artigena*, Meyr., a moth that was first recorded in 1920 and then not again until 1926. In the five specimens observed, the egg stage lasted 13 days, the larval 54, and the pupal 4; 184 eggs were deposited by one individual over a period of 5 days, the preoviposition period lasting 1 day.

Minor pests of coffee included *Eucosma nereidopa*, Meyr., and another unidentified berry borer, which are reported for the first time; *Heliothis* (*Chloridea*) *obsoleta*, F., which caused considerable damage to foliage and green berries in one district and then disappeared, over 50 per cent. of the larvae being parasitised by a Tachinid; *Ceratitis capitata*, Wied., which attacks the berries but does not actually damage the beans; and *Apate monacha*, F.

Insect infestation of cotton is at present very heavy in Kenya, and in order that it may be a paying crop, the strict enforcement of a close season for about 2 months from 21st March is suggested. About 15 per cent. of the first crop is destroyed by *Platyedra gossypiella*, Saund. (pink bollworm) and *Dysdercus* spp. (cotton-stainers). It is probable that the former completes its life cycle in 35–40 days, so that there can be four generations on cotton in a season. It has so far only been found on cotton. No trace of resting larvae has been found. A Braconid parasite is of considerable value, though it can only attack the larvae in opened bolls. To avoid the further distribution of *P. gossypiella*, the export from infested areas of unginned cotton, or cotton seed within 2 months of its being picked should be prohibited. Against *Dysdercus*, hand-picking is recommended; traps should not be used, as if neglected they become breeding-places for the pest. Cotton lint is not damaged by *Oxycarenus hyalinipennis*, Costa (cotton seed bug) if it is spread in the sun for 2–3 days after it has been picked. Injury to the seed can be minimised by frequent picking of the seed cotton. Minor pests of cotton included *Earias insulana*, Boisd., *Heliothis obsoleta*, *Nezara* sp., and *Ferrisia virgata*. Much closer spacing of cotton plants than that at present in practice and a simple form of crop rotation are recommended and discussed.

Maize is planted at all times of the year, and self-sown maize is never destroyed, so that the borers, *Sesamia calamistis*, Hmps., and *Busseola fusca*, Fuller, which appear to be indigenous and have a wide distribution, are constantly present.

The report is followed by a summary of the conclusions arrived at by the entomological section of the Agricultural Conference held in August 1926 [*R.A.E.*, A, xv, 559].

KIRKPATRICK (T. W.). **The Common Coffee Mealybug** (*Pseudococcus lilacinus*, **Ckll.**) **in Kenya Colony.**—[*Bull. Dept. Agric.*] *Kenya*, no. 18, 110 pp., 15 figs. Nairobi, 1927.

Much of the information in this bulletin has been noticed in a recent paper [*R.A.E.*, A, xv, 565]. Several species of mealybug occur on coffee in Kenya Colony [see preceding paper]; of these *Pseudococcus lilacinus*, Ckll., previously recorded as *P. citri*, Risso [xv, 565, etc.], is by far the most important and is the one here dealt with. A description of the adult female is given, and notes are also given on two apparently biological subspecies, one of which has been recorded on *Hibiscus gossypinus* and the other on the shrub, *Combretum splendens*. Each of these was extensively attacked by a minute Hymenopterous parasite, neither of which, however, could be reared on the coffee-feeding form of *P. lilacinus.* Five other Coccids that might be mistaken for *P. lilacinus* are recorded. The food-plants of the latter, which are enumerated, include 31 species, of which 9 are cultivated. The adult deposits from 50 to 200 eggs, probably more, at the time when the coffee flower-buds are available for food, and in 2 or 3 days the young mealybugs crawl for a short distance, generally in an upward direction, and begin to feed. The female requires about 36 days for development from egg to adult, passing through three intermediate stages, while the male requires about 33 days and has four intermediate stages, of which the last two are quiescent. Parthenogenetic reproduction is apparently the rule while there is an abundance of the most nutritious food, but males are produced when this fails and the race tends to become less vigorous. Weather conditions seem to have little effect on the reproduction of *P. lilacinus* but, if food conditions are equal, infestation is always more severe in sheltered positions, probably because they are unfavourable to the enemies of the mealybug. The most important agent in dispersal is wind, particularly the dust storms that usually occur in the warmer seasons ; men and animals, especially natives wearing blankets and oxen used in cultivation, also carry the insects frequently, and young coffee plants from infested nurseries are a common source of infestation.

Over 40 species of predators and parasites of *P. lilacinus* are known, but their activities are limited by ants, by far the most important being *Pheidole punctulata*, Mayr. The distinguishing characters of this ant are given, with a description of the workers and queen and an account of the bionomics. The nests are small but numerous ; where mealybugs are well established, there may be 3 or 4 nests to each tree, these always being in the soil or under stones, etc., absence of light being essential to them and humidity of the soil an advantage. The food consists chiefly of honeydew from various species of Coccids (which are enumerated) and from the coffee aphis, *Toxoptera aurantii*, Boy., the preferred source being *P. lilacinus.* The mealybugs multiply three times as rapidly when the ants are in attendance on them, and moreover these destroy practically all of the beneficial insects that are predacious on them. There are no effective natural enemies of the ant, but the warrior ants, *Dorylus* spp., eradicate any that they happen to meet in their path. Torrential rains destroy thousands of them. Five other species of ants, including *Acantholepis capensis*, Mayr, have been found in attendance on *P. lilacinus*, but have never been observed in company with *Pheidole punctulata.*

Besides the predators of *P. lilacinus* [xv, 566], five different species of Chalcid have now been obtained from it, but some of them may be hyperparasites.

The most serious damage done to the coffee plant by *P. lilacinus* is the direct loss of crop caused, and since it is the flower-buds and young fruit that are chiefly attacked, it follows that the more healthy a tree is and the better it is able to produce a large crop, the more likely it is to become severely infested. Many of the infested flowers open and the young fruit sets, but before having grown appreciably it dries up, the dried fruit remaining on the tree for a considerable time. Half-grown or larger fruits, although less frequently attacked, are sometimes destroyed by a large cluster of mealybugs on the pedicel, but those almost or quite mature do not appear to be injured. In cases of severe attack all the leaves may be shed. The fruit-fly, *Ceratitis capitata*, Wied., is frequently found where there is mealybug infestation, being probably attracted by the honeydew. The author estimates that during the first 6 months of 1927 the financial loss due to *P. lilacinus* was at least £100,000. Slight damage is sometimes also done to certain fruit trees, especially guavas and custard apples (*Anona reticulata*), and crops recorded as badly attacked include pigeon peas (*Cajanus indicus*), yams (*Dioscorea*) and sweet potatoes.

Recommendations for reducing infestation are to plant only clean nursery stock and to permit as free a circulation of air as possible in the plantation and round the plants. The movement of men and animals from an infested area to a clean one should be avoided so far as possible. No fumigant is known that will kill the mealybug without severely injuring the tree. By spraying, it is impossible to reach all mealybugs on a large tree, and most of the predators are killed or repelled ; moreover, natives cannot be depended upon to spray successfully. Various sprays are discussed, however, of which one of the most successful has already been noticed [*R.A.E.*, A, xiii, 523]. Painting the affected parts of the tree with methylated spirit or paraffin has given satisfactory results.

As the mealybug could probably be exterminated by natural enemies if it were not for the presence of ants, every effort has been made to drive the latter from the trees. Although the nests are in the ground, ploughing or harrowing has very little effect, as the ants carry the immature stages into safety and construct a fresh nest. Lime seems to have a slightly repellent action against nest-building ; none of the usual manures used on coffee plantations apparently has any effect, but the fact that the ants are attracted to cattle and goat manures can be utilised in concentrating their nests. Poisons were in no case effective, though several of the bait tests are described. Over one hundreds methods of preventing ants from climbing coffee trees have been tried. A mixture of 4 parts of crushed limestone to 1 part of naphthalene is an effective repellent, provided that the weather is absolutely dry and that the mixture is finely powdered ; it is probably the best repellent for use on multiple stem trees, where the placing of bands is a laborious and expensive proceeding. Paradichlorobenzene proved quite useless. A list is given of many banding materials that were tried but were crossed by the ants without difficulty. A dilute form of tanglefoot in which is incorporated mercury bichloride is described ; this gave some success, but the most effective repellent is a high boiling-point tar oil obtained by distilling creosote or anthracene oil at a temperature of 300° C. (at an altitude of 6,000 ft.), the residue being used. The specification is given. For applying this repellent on large trees (more than 2½ ins. in diameter), bands of butter muslin, 2½ to 3 ins. wide, should be soaked in the oil and squeezed until they do not drip. A band of cotton wool should be placed round the trunk immediately below the lowest lateral branch, and over this a band of grease-proof paper 4 or 5 ins. wide. Over this is applied the oily band. This should repel the ants for 3 or 4 months without renewal. Plenty of cotton wool should be used on young trees in order to avoid constriction of the trunk. A safer method for young trees is to soak paper cones in the oil and attach them to the tree with cotton wool under the top rim. The cost of these methods is discussed. Under favourable conditions, a tree so banded may be cleared of the mealybug by natural enemies within three or four weeks. A certain number of mealybugs will be found below the bands, especially if suckers are allowed to grow from the base of the trees. It might be worth while covering the whole base of the tree trunk, from the lowest lateral branch down to the ground, with a weather-proof lime-wash [*R.A.E.*, A, xiii, 553].

The nests of *Pheidole* can be most successfully destroyed in October and March, just after the rains, when they are near the surface. Hot water is efficient on small areas ; on larger ones the nests should be exposed and a painter's blow-lamp passed over them. Calcium cyanide is effective if a sufficient quantity is used, but is very expensive. Destruction is far more effective if the nests can be concentrated first ; they are seldom constructed under the heavy shade of a large tree, so that in a plantation of large trees the nesting-places are comparatively restricted, and the nests can be still further concentrated by heaping dead leaves and prunings covered with an inch or two of soil in the open spaces ; when the rains start the majority of the nests are moved to these heaps. Goat or cattle manure is also effective if placed in shallow pits in the open spaces between trees. The ants, however, multiply so rapidly that it is very little use destroying only a proportion of the nests.

The best methods of utilising such beneficial insects as occur and of increasing their numbers are discussed. In dealing with a new or slight infestation of a few trees only, heavily infested branches and prunings from infested trees should be burnt or buried and any remaining mealybugs should be painted as described above. The few ants' nests that may occur should be destroyed. In dealing with a widespread infestation where *P. punctulata* is present in numbers, banding should be practised and prunings should not be burnt, but those from trees at the edge of an infested plantation should be carried a few rows outside.

The legislation preventing the movement of coffee plants from the area infested with the coffee mealybug is quoted in an appendix.

Trabut (L.). **Le criquet pélerin dans le Sud.**—*Bull. agric. Algérie*, xxxiv, no. 1, pp. 10–13. Algiers, January 1928.

Although invading swarms of locusts [*Schistocerca gregaria*, Forsk.] from the Sahara are threatening the cultivated regions of Algeria, the author considers that, apart from the excessive cost, attempts at control measures on a large scale in the nearer regions of the Sahara would be useless, since most of the swarms arrive from areas farther south. On the other hand, the control of locusts in cultivated areas would not present any great difficulties, if poisoned baits were used ; the wide application of the latter is impossible at present, owing to the law prohibiting the use of arsenicals, and a revision of this law is most desirable.

D[upont] (P. R.). **Des ravages causés par les cochenilles sur les cocotiers aux Seychelles.**—*Bull. Dept. Agric. & Pêche Seychelles*, no. 8, pp. 7–8. Victoria, Seychelles, 1927.

The Coccids, *Pinnaspis buxi*, Bch., and *Ischnaspis longirostris*, Sign. (*filiformis*, Dougl.) are causing considerable injury to coconuts in the Seychelles, entirely covering the foliage, flowers and nuts. They are infested by two fungi, one (*Cladosporium herbarum*) being black and attacking *I. longirostris*, and the other, which is whitish in colour, attacking *P. buxi*. Although these fungi are likely eventually to effect complete control of the Coccids, as other species occurring on coconuts have been exterminated in the past, their adequate development is dependent on climatic conditions, and other measures, such as cutting off infested leaves and flowers and burning the apex of the tree in severe cases, are recommended. The leaves may be left lying on the ground under the trees for a few days to give opportunity to parasites and fungus spores to escape before they are burned. Careful cultivation, including irrigation in case of drought, draining of excessive moisture from the roots and treatment of the soil with ashes or potash salts, renders the trees more resistant to attack.

CHAPMAN (R. N.). **The quantitative Analysis of environmental Factors.** —*Ecology*, ix, no. 2, pp. 111–122, 1 fig., 17 refs. Brooklyn, N.Y., April 1928.

The hypothesis that the balance of numbers of organisms in nature is maintained by their tendency to produce large numbers of offspring and for the environment to take a large toll from the numbers produced, was tested by experiments in which flour beetles, *Tribolium confusum*, Duv., were maintained in environments of known size. It was found that the numbers of individuals increased until there were 43·97 per gramme of flour. Although thousands of eggs were laid daily, the numbers of individuals remained at this figure, with a standard deviation of 4·27 and a probable error of 2·88. The adult beetles ate the immature stages in proportion to the concentration of the individuals. It is suggested that environmental factors may be measured in terms of their effect in reducing the potential rate of increase.

PAPERS NOTICED BY TITLE ONLY.

OREST (M.). **Beiträge zur Kenntnis der Frassbilder einiger Borkenkäfer.** [Contribution to the Knowledge of characteristic Injury caused by certain Barkbeetles.]—*Verh. siebenbürg. Ver. Naturw.*, lxxvii, pt. 1, pp. 58–63, 2 figs., 5 refs. Hermannstadt, 1927.

FEYTAUD (J.) & DIEUZEIDE (R.). **Sur un champignon du genre** *Termitaria* **parasite du termite lucifuge** [*Reticulitermes lucifugus*] **en Gironde.**—*Rev. Hist. nat. appl.*, (1) viii, no. 11, pp. 336–347, 2 pls., 1 fig., 11 refs. Paris, November 1927. [*Cf. R.A.E.*, A, xv, 647.]

ANDREWS (E. A.). **Tea Green Fly** (*Empoasca flavescens*, **Fabr.**) [**in India**].—*Trop. Agriculturist*, lxix, no. 6, pp. 340–345. Peradeniya, December 1927. [See *R.A.E.*, A, xv, 673.]

WALKER (H. W.) & MILLS (J. E.). **Chemical Warfare Service Boll Weevil** [*Anthonomus grandis*, **Boh.**] **Investigations** [**Progress Report**].—*Indus. & Engin. Chem.*, xix (1927), no. 6, pp. 703–711. Abstract in *Expt. Sta. Rec.*, lvii, no. 9, pp. 860–862. Washington, D.C., December 1927. [See *R.A.E.*, A, xiv, 534.]

TRIMBLE (F. M.). [**List of**] **Scale Insects of Pennsylvania (Homop.: Coccidae).**—*Ent. News*, xxxix, no. 2, pp. 42–47. Philadelphia, Pa., February 1928.

HARGREAVES (H.). **Annual Report of the Government Entomologist.**—[*Rep. Dept Agric. Uganda 1927*] 11 pp. typescript. [Entebbe, 1928.]

The two species of *Antestia*, now identified as *A. lineaticollis*, Stal, and *A. faceta*, Germ. [*R.A.E.*, A, xvi, 62], caused considerable damage to *Coffea arabica*, and it is thought that soil conditions may have an important bearing on the occurrence of these pests and of other types of sucking insects. Several outbreaks of *Stephanoderes hampei*, Ferr., were reported ; on part of one estate practically all the coffee berries had been bored while unripe and the beans had decayed. Examination of coffee trees showing yellowing of foliage and unsatisfactory growth showed that *Pseudococcus lilacinus*, Ckll., was present on the roots of some trees only, while all the trees were found to be infested with *Rhizoctonia bataticola*, and this fungus (or some other cause of ill-health of the trees) must be regarded as predisposing the trees to attack by the mealybug and other sucking insects. The use of calcium cyanide against *P. lilacinus* proved successful, though it is probable that much of the improvement in the general appearance of the trees was due to the effect of the lime in the insecticide on the soil. The following Coccids have been prevalent on small areas where conditions rendered coffee plants susceptible to attack : *Icerya nigroareolata*, Newst., *Ceroplastes ceriferus*, And., *C. vinsonioides*, Newst., *Coccus* (*Lecanium*) *subacutus*, Newst., *C.* (*L.*) *viridis*, Green, and *Saissetia hemisphaerica*, Targ. (both infested by the fungus, *Cephalosporium lecanii*), *Asterolecanium hancocki*, Laing, *Selenaspidus articulatus*, Morg., and *Ferrisia* (*Pseudococcus*) *virgata*, Ckll. During the drought early in the year, several outbreaks of *Diarthrothrips coffeae*, Will., were reported, the entire coffee crop on one estate being destroyed. Since light or stony soils favour this pest, they should be protected from sun and heavy rains by mulching, cover crops or shade trees, the humus being preserved and replenished so that water may be retained in the soil. Five species of Capsids, including *Volumnus obscurus*, Popp., have been observed attacking coffee flower-buds, but the exact form of injury is not known. The Bostrychid, *Apate indistincta*, Murr., occurred on native grown *Coffea arabica*. The Lamiid, *Dirphya princeps*, Jord., was recorded on both *C. arabica* and *C. robusta* in several areas. Neglected cultivation, resulting in bushy growth and tall weeds, appears to favour this pest, possibly because these factors hinder the activities of the Braconid parasite of the larva. Leaf-eating insects, all of minor importance, were the Drepanid, *Metadrepana glauca*, Hmps., the Limacodids, *Parasa* sp., and *Thosea aurifrons*, Beth.-Bak., the Pyralid, *Lygropia amyntusalis*, Wlk., the Sphingid, *Cephonodes hylas*, L., the Melolonthid, (?) *Trochalus* sp., and *Epiplema dohertyi*, Warren, which was controlled by parasites. Other pests of coffee were the Tenebrionid, *Gonocephalum simplex*, F., which attacked the bark near the collars of the main stem and was evidently encouraged by the presence of tall weeds covering much decaying vegetation on the surface of the soil, the Curculionid, *Isaniris pusillus*, Hust., and termites, which attacked coffee seedlings with root disease caused by *Rhizoctonia*.

The pests of cotton included : *Pseudococcus brevipes*, Ckll., on the roots ; *Dysdercus* spp., which occurred only after the heavy rain in December, the drought having apparently made the insects aestivate or remain on their wild food-plants ; *Aphis gossypii*, Glov., which also occurred on *Hibiscus esculentus*; *Euxoa longidentifera*, Hmps.; and *Earias* sp., which is parasitised by the Braconid, *Microbracon* sp., and the Tachinid, *Actia nana*, Curran.

A widespread outbreak of *Cosmopolites sordidus*, Germ., occurred on plantain and banana (*Musa* spp.). A serious attack by *Acraea acerata*, Hew., early in the year, combined with the effect of drought, delayed the maturing of the sweet potato crop for two months. The Ichneumonid, *Charops* sp., and the Tachinid, *Zenillia normula*, Curran, were reared from this butterfly. The vector of rosette disease of groundnut (*Arachis*) in Uganda has now been identified as *Aphis laburni*, Kalt. *Busseola fusca*, Fuller, did considerable damage to maize. The injury to sugar-cane by *Sesamia vuteria*, Stoll, was negligible on the only large plantation in Uganda; the control measures advocated, assisted by a Tachinid parasite [*R.A.E.*, A, xvi, 63], appear to have been successful. Investigation of rubber [*Hevea*] proved that Scolytid stem borers only attack trees weakened by diseases or mechanical injury.

Other pests were: on *Citrus*, *Papilio demodocus*, Esp. (parasitised by the Tachinid, *Zenillia evolans*, Wied.), and *Lepidosaphes beckii*, Newm., a severe infestation of the latter occurring on a young plant that was infected with *Rhizoctonia bataticola*; on loquat [*Eriobotrya japonica*], the Pyralid, *Pogononeura xantholepia*, Hmps., injuring the ripe fruit; on papaya (*Carica*), an Aphid infesting the young leaves, which was preyed on by the Coccinellid, *Halyzia variegata*, F.; on *Eucalyptus* spp., the cutworm, *Euxoa longidentifera*, Hmps., and the Lymantriid, *Notolophus vetustus*, Hmps.; in bamboo, the Bostrychid, *Xylopertha picea*, Oliv.; on *Elaeis guineënsis* (oil palm), *Rhynchophorus phoenicis*, F., in the stem, *Aspidiotus cyanophylli*, Sign., on the seed, and an Aleurodid, infested by *Cephalosporium lecanii*, on the leaves; on tobacco, *Brachytrypes membranaceus*, Drury; on turnip, *Pseudococcus citri*, Risso; on *Sesamum*, a Cecidomyiid producing galls and causing shedding of seed pods, *Cylas compressus*, Hartm., which also attacked the seed pods, and the Pyralid, *Antigastra catalaunalis*, Dup., which damaged the tops of the plants; on *Hibiscus* sp., *Acraea terpsichore*, L.; and on *Hydnocarpus* sp. (leprosy oil), *Acraea zetes*, L. Notes are also given on pests of ornamental plants. In most if not all cases of termites attacking living plants some fungus or disease was present that rendered the plants suitable as food for them.

DE LÉPINEY (J.). **Les insectes nuisibles du chêne liège dans la forêt de la Mamora (Maroc).**—*Ann. Epiphyt.*, xiii, no. 3, pp. 145–174, 2 pls., 3 maps, 25 refs. Paris, May–June 1927.

This study of the insect pests of the cork oak in a forest district in Morocco deals almost exclusively with conditions in 1926 and can only be considered as a preliminary survey of the subject. The most important insect attacking the foliage is *Porthetria* (*Lymantria*) *dispar*, L., which appeared as early as 15th March in 1926. Hatching occurs over a period of about a month. Pupation began about 13th May, and adults began to appear on 27th May.

During the previous winter the egg-masses had been very abundant, and it was easy to predict the heavy defoliation that occurred in the spring; in the autumn of 1926, however, the egg-masses, although numerous, were almost entirely destroyed by natural means, so that not more than one-tenth of those deposited remained on the trees. Many of these were infertile, many were eaten by insectivorous birds, and many were destroyed by Dermestid beetles, particularly by *Trogoderma versicolor* var. *meridionale*, Kr. These beetles devour the dead eggs that have lost their covering ; they live in the egg-masses, their galleries riddling them until they are loosened from the tree and become finally knocked or blown off. One larva towards the end of its development eats as many as 50 eggs in a month. It is not known whether healthy eggs are attacked in nature, but it is significant that, in contrast to the above, in 1925–26 the egg-masses were very healthy and larvae of Dermestids were very rarely seen. The conclusion reached is that when 25 per cent. of the eggs are dead, the activities of *Trogoderma* have a considerable effect on the remaining ones by simple mechanical action ; a healthy egg-mass may be attacked, but this is quite exceptional, the number of eggs eaten is insignificant and the galleries remain unfinished. Another, unidentified Dermestid has similar habits, but its value has not been determined. Certain Staphylinid larvae also occurred in the egg-masses ; these may be predacious on *Trogoderma*, but they serve further to disintegrate the masses by mechanical action. The Proctotrupid, *Telenomus phalaenarum*, Nees, and the Chalcid, *Ooencyrtus* (*Schedius*) *masii*, Mercet, parasitise the eggs, but their economic importance is not known.

The natural factors tending to reduce the numbers of the larvae are discussed. The chief cause of mortality in larvae of the second and third instars are the Braconids, *Apanteles solitarius*, Ratz., and *Meteorus pulchricornis*, Wesm. The first cocoons of *A. solitarius* were found on 2nd April, and the first adults appeared on 9th April, the last emerging on 28th May. In 1926, two generations developed on *P. dispar*, the degree of parasitism averaging 25 per cent. Hyperparasites attacking *A. solitarius* are the Ichneumonids, *Hemiteles areator*, Grav., and *Pezomachus nigritus*, Forst., and the Chalcids, *Dibrachys cavus*, Wlk. (*boucheanus*, Ratz.) and *Habrocytus poecilopus*, Crawf. The first cocoons of *M. pulchricornis* were found on 16th April, and the last emergence was at the end of May. The full life-cycle has not been observed, but it is probable that two generations are produced on *P. dispar* ; parasitism is always low, apparently less than 10 per cent. The hyperparasites mentioned above, except *D. cavus*, occur also on this parasite. Larvae of *P. dispar* in the fourth instar are parasitised by the Tachinid, *Sturmia inconspicua*, Meig., the biology of which has not been studied in Morocco. In 1926, the first pupae were collected on 10th May and the last on 28th May. The degree of parasitism was low. The alternative hosts usually found in Europe do not appear to be present in Morocco, where they have not been determined. During May, the cork oak is generally defoliated, and as only the oldest larvae of *P. dispar* have pupated by that time many of the remaining ones die of famine ; others pupate prematurely, producing undersized adults, and it is probably these that give rise to the numbers of infertile eggs of the next generation. Many larvae found in the field have died from grasserie disease, and many are killed by birds. The Carabid, *Calosoma sycophanta*, L., is scarce in Morocco, but spiders and a few predacious insects occasionally attack the larvae of *P. dispar*. About half of the pupae died during the defoliation period in 1926, apparently through famine. Parasites of the pupae are scarce ; *Pimpla instigator*, F., is occasionally found, and also *Brachymeria* (*Chalcis*) *intermedia*, Nees. The Japanese egg-parasite, *Ooencyrtus* (*Schedius*) *kuwanae*, How., has been introduced from America.

The only other pest of serious importance on the cork oak in 1926–27 was the ant, *Cremastogaster scutellaris*, Ol., the galleries of which are found in the cork of practically every oak in the locality examined. Brief notes are given on the minor pests, the more important being *Cossus cossus*, L., *Cerambyx cerdo*, L., var. *mirbecki*, Luc., and *Platypus cylindrus*, F., all of which bore into the trunk ; *Acrobasis glaucella*, Stdgr., which feeds on the parenchyma of the leaves, which it webs together ; *Catocala nymphagoga*, Esp., which devours the leaves, and the Aphid, *Chaitophorus* sp., which produces honeydew and encourages sooty mould on the leaves, and is preyed upon by *Coccinella lyncea*, Ol., *C. decempunctata*, L., and an undetermined Hemerobiid. A list is given of further insects that have previously been recorded on the cork oak in Morocco.

FERRIÈRE (C.). **Les parasites et hyperparasites de** *Lymantria dispar* **au Maroc.**—*Ann. Epiphyt.*, xiii, no. 3, pp. 175–180, 26 refs. Paris, May–June 1927.

The author gives systematic notes on some of the Hymenopterous parasites of *Porthetria* (*Lymantria*) *dispar*, L., recorded in the preceding paper, which were indentified by him. Among those dealt with it is mentioned that the Pteromalid, *Dibrachys cavus*, Wlk. (*boucheanus*, Ratz.), although always a hyperparasite where *P. dispar* is concerned, may sometimes be a primary parasite. The author agrees with Faure in considering that *Hypopteromalus* is not distinct from *Habrocytus* and he regards *Habrocytus bedeguaris*, Thoms., as a synonym of *H.* (*Hypopteromalus*) *poecilopus*, Crawf. *Brachymeria* (*Chalcis*) *intermedia*, Nees, which is a parasite of the pupae of *P. dispar* and of many other Lepidoptera, has frequently been recorded as *C. flavipes*, Panz. The true *B.* (*C.*) *flavipes*, Panz., however, is an exotic species from the West Indies, and all records of it in Europe really refer to *B. intermedia*.

POUTIERS (R.). **La sensibilité des insectes aux stimulants chimiques.**—*Ann. Epiphyt.*, xiii, no. 3, pp. 181–194, 1 fig. Paris, May–June 1927.

A number of experiments have been carried out to determine the reactions produced by certain chemical mixtures on the olive fly, *Dacus oleae*, Rossi, which causes heavy losses each year in the south of France. The bait in each case consisted of 50 cc. of the liquid tested, which was placed in a small glass dish under a wire gauze fly-trap, which is described. Mixtures with a basis of beer or molasses were the only ones that, while attracting a number of insects, exercised an attractive stimulus on *D. oleae*, while certain natural essences tested had but little effect on insects usually found in traps, and none at all on *D. oleae*. The height of the bait trap above the ground made no difference to its attractive properties. A list is given of the insects caught in the traps, which were chiefly Diptera.

The toxicity of various poisons was then tested in glass cages containing a branch of olive sprayed with the substances tried, into which 20 individuals of *D. oleae* were introduced. A basis of 10 per cent.

molasses was used in all cases. Solutions of sodium arsenate proved by far the best for the purpose, being the least repellent to the fly and acting most rapidly. With a 1 : 1,000 solution 90 per cent. of the flies were killed in 50 hours ; with 2 : 1,000, 100 per cent. were killed in 37 hours ; and with 1 : 100, 100 per cent. were killed in 27 hours. From 25 to 85 per cent. were killed in 37 hours with 5 or 10 per cent. of urotropine (hexamethylene-tetramine), and fair results were obtained with 1 per cent. of ordinary triplumbic lead arsenate, which killed about 90 per cent. in 50 hours.

Acuerdo por el cual se establece una zona de defensa para las entidades federativas del noroeste de la republica. [Resolution establishing a Quarantine Zone for the States of North-western Mexico.]—*Bol. mens. Defensa agric., Sec. Agric. y Fomento, Mexico,* i, no. 6, pp. 444–447. S. Jacinto, D.F., November 1927.

A quarantine zone has been established, by a resolution dated 8th November 1927, in order to protect the north-west of Mexico against the Mexican fruit-fly, *Anastrepha ludens,* the potato weevil, *Epicaerus cognatus,* and the pink bollworm of cotton, *Platyedra* (*Pectinophora*) *gossypiella,* and other pests. The importation of fruits, cotton and other products likely to harbour these pests is subject to special restrictions.

MONTGOMERY (J. H.). **Changing Conditions in Plant Quarantine Activities.**—*Mon. Bull. Plant Bd. Florida,* xii, no. 7, pp. 135–140. Gainesville, Fla., January 1928.

Changed conditions brought about by the development of motor transport and the increased import of foreign plants, facilitated by an augmented service of rapid steamers equipped with modern refrigerating plants, are continually rendering more complicated the question of plant quarantine. In order to meet present requirements it is suggested that the port inspection service should be expanded and developed and the nursery inspection service rendered more efficient, while domestic quarantines should be simplified and made to apply only to major pests. An adequate nursery inspection service might be secured by a combination of frequent field inspections, point of origin (packing house) inspection and terminal inspection at the point of destination, its object being to prevent the dissemination of pests of primary importance and to insure reasonable freedom from minor pests.

HUTSON (R.). **Relation of the Honeybee to Fruit Pollination in New Jersey.**—*Bull. N.J. Agric. Expt. Sta.,* no. 434, 32 pp., 3 figs., 127 refs. New Brunswick, N.J., June 1926.

This paper deals with studies of factors connected with the pollination of fruits by insects under New Jersey conditions. All fruits tested showed an increased set when insects work freely among the blossoms. This applied to both self-sterile and self-fertile plants, but especially to the former. The number of insects acting as fruit pollinators in southern New Jersey is small ; honey-bees and bumble bees are the most important.

DOSDALL (L.). **A Mosaic Disease of Gladiolus.**—*Phytopathology*, xviii, no. 2, pp. 215–217, 2 pls. Lancaster, Pa., February 1928.

Mosaic disease of *Gladiolus* is transmitted through the corm from one generation to the next until the plant is killed. Probably the disease is transferred from one plant to another by sucking insects. *Aphis gossypii* was found in large numbers on the buds under the sheaths of some corms examined, and many of the plants from these corms showed symptoms of the disease.

CARTER (W.). **An Improvement in the Technique for feeding Homopterous Insects.**—*Phytopathology*, xviii, no. 2, pp. 246–247, 1 ref. Lancaster, Pa., February 1928.

The method of feeding Homoptera previously noticed [*R.A.E.*, A, xvi, 70] may be adapted to petri dishes by placing a piece of membrane over the dish, taking care that good contact is made with the surface of the liquid in it. A rubber band is used to hold the membrane to the dish.

Division of Entomology.—*46th Rep. New York Agric. Expt. Sta. 1926–27*, pp. 43–50. Geneva, N.Y., 1928.

Experiments with various types of oil sprays against *Anuraphis roseus*, Baker (rosy apple aphis), applied during the dormant period or as the tips of the leaves were showing, indicated that newly-hatched larvae are more susceptible than the eggs to 2 per cent. lubricating oil emulsion, which is rendered more toxic to them by the addition of nicotine sulphate or superfine tobacco dust. Combinations of oil sprays with these materials are safer for unfolding leaves than oil sprays alone with sufficient oil content to insure adequate control of the Aphids. Bordeaux mixture proved the most satisfactory fungicide for use with oil emulsions, the addition of sodium sulphide or copper sulphate causing damage to unfolding leaf and blossom buds. While 2 per cent. emulsions have not proved dependable ovicides, preparations containing 4 per cent. oil or more appear highly toxic to the eggs, though they involve greater expense and risk of injury.

Experiments to determine the practicability of confining spraying operations against the codling moth [*Cydia pomonella*, L.] to the suppression of the first generation larvae showed that three treatments of 2 per cent. white oil directed against the eggs and newly hatched larvae afforded noticeably less protection to the apple crop than a similar number of applications of lead arsenate. The application of a 3 per cent. oil emulsion on the hibernating adults and eggs of the pear psylla [*Psylla pyricola*, Först.] reduced the number of overwintering adults on the trees at the time of treatment, and though the eggs were more resistant, it appears that the oil residues on the bark are toxic to newly hatched larvae. Accurate information is secured as to the date of appearance and maximum emergence of the cherry fruit-flies, *Rhagoletis cingulata*, Lw., and *R. fausta*, O.S., by means of cages in a number of commercial plantings [*R.A.E.*, A, xiv, 580].

Experiments against *Pulvinaria* (?) *amygdali*, Ckll. [*R.A.E.*, A, xv, 426, 427] and *Lecanium corni*, Bch., on peaches showed that a 4 per cent. lubricating oil applied in early spring is the most practical treatment.

In experiments for the control of the striped cucumber beetle [*Diabrotica vittata*, Say] various arsenical dusts with hydrated lime as the carrier proved superior to sodium fluosilicate mixtures, chiefly owing to the injurious effect of the latter on the plants. Nicotine dusts at 2 per cent. strength gave equally good results owing rather to the effect of the dust in protecting the foliage than to the toxicity of the nicotine to the beetles. A 3 per cent. strength of nicotine stunted the growth of the plant. With the exception of a spray composed of calcium arsenate 4 lb., fish oil 1 U.S. qt., and water 50 U.S. gals., arsenical sprays were less successful than dusts. A high mortality was secured in field trials by concentrating the beetles on squash plants and using box fumigators [xv, 151]. The best results were secured by keeping the squash plants small by renewed sowings, as large plants prevent the dust from coming in contact with many of the beetles.

The results of spraying and dusting experiments on potatoes are reviewed [xvi, 204].

Experiments in the control of Aphids and thrips in cauliflower seedbeds included protection of the beds with cheesecloth, which, however, retarded the subsequent development of the plants; and comparative studies of the amount of tobacco dusts required, which showed that a considerable reduction could be effected without loss of efficiency by the addition of 50 per cent. hydrated lime and 7 per cent. water to the pure tobacco dust.

SMITH (R. E.) & HANSEN (H. N.). **The Improvement of Quality in Figs.**—*Circ. California Agric. Expt. Sta.*, no. 311, 23 pp., 16 figs., 3 refs. Berkeley, Cal., December 1927.

The principal trouble affecting figs in the orchard in California is endosepsis, which occurs in figs caprified by the Chalcid, *Blastophaga* [*psenes*, L.] [*cf. R.A.E.*, A, xiv, 61; xv, 284, 595]. Treatment carried out in 1927 against this disease by hypodermic injection with a fungicidal solution [xv, 284] was 100 per cent. effective in disinfecting mamme figs [the winter generation of figs containing *Blastophaga*], but this method is not practicable for large areas, owing to its slowness, the amount of labour required and the possibility of leaving some figs untreated. Another method was employed by which all mamme figs in one area were stripped off, a few being left on trees in another isolated place until they began to soften and mature and the Chalcids started to emerge, when they were removed, cut in two and soaked in a disinfectant solution for about 15 minutes. These pieces were then put into baskets and hung on the trees to allow the Chalcids to escape, but had to be destroyed at the end of 5 days, as the disinfection is not permanent and there is a possibility of some of the fungus remaining alive in the tissues. Some infected Chalcids are also likely to escape before the figs left on the trees are removed for treatment, and are liable to contaminate figs in the vicinity, thus constituting an area that will have to be cleaned up the following year. The demonstration orchards, however, showed less than 5 per cent. endosepsis in the total crop, and the figs were superior to those in any other orchard examined in 1927, or in past years.

A method devised by the junior author, calculated to effect the cleaning up of the whole territory in one season, consists in removing all mamme figs from the trees 30 days before maturity, and despatching them for storing and disinfection to a centrally placed insectary, whence no *Blastophaga* could escape. Here the insects would be made to emerge into sterile vials in which they might be transported and placed in trees to caprify the crop. Preliminary tests have shown that *Blastophaga* will live in such vials for more than two weeks and that they can be kept dormant by chilling with ice. The carrying out of these measures would necessitate a complete survey of the area in order to locate every caprifig tree and graft, every mamme fig on which would have to be removed before 15th February, and the cutting off and burning of parts of large or old trees from which it was impossible to remove the figs. All figs not needed for despatch to the insectary would have to be destroyed.

Another serious disease of figs is souring, which is caused by yeast, followed by the action of bacteria and moulds. It is started by insects, particularly *Carpophilus hemipterus*, L. (dried fruit beetle), and is spread by these and other insects, especially *Drosophila.* This disease causes the contents of the ripe fig to ferment and sour, liquid subsequently dripping from the eye. The dried fig is hollow and has a sour taste and odour, while the outside is shrivelled and discoloured. The best method of preventing souring is probably the control of *C. hemipterus*, and a list of the fruits likely to harbour this beetle is given, classified under each month of the year. All such material should be removed from the vicinity of the fig orchards. Certain kinds of figs, in which the eye of the fruit is too small to allow the beetle to enter, are comparatively free from this disease.

Other diseases of figs are smut, which is caused by the common black mould fungus, *Aspergillus niger*, the spores of which are usually carried into the figs by *C. hemipterus* when coming from rotten fruit ; and various kinds of mould, mainly started by the same beetle.

General remedial measures proposed include : The destruction of all unnecessary caprifig trees, and of all rotten or old dried fruit near fig orchards, including old caprifigs in baskets ; keeping the ground beneath the trees clean and dry during harvest ; refraining from shaking the trees, and allowing the figs to get as dry as possible before they drop ; frequent picking up of figs, including bad fruit, which should be destroyed ; and prompt delivery of fruit to the packer without dipping, washing or wetting unless such treatment is requested.

PETTIT (R. H.). **The Mexican Bean Beetle.**—*Circ. Michigan Agric. Expt. Sta.*, no. 107, 8 pp., 5 figs., 2 refs. East Lansing, Mich., December 1927.

A review is given of the bionomics, control and distribution of *Epilachna corrupta*, Muls. (Mexican bean beetle) in view of the fact that it has now been found in Michigan.

ISLEY (D.). **The Cotton Hopper and associated Leaf-bugs attacking Cotton.**—*Ext. Circ. Coll. Agric. Univ. Arkansas*, no. 231, 8 pp., 2 pls., 5 refs. Little Rock, Ark., March 1927.

During the early summer of 1926 there was a severe outbreak of *Psallus seriatus*, Reut. (cotton hopper), *Lygus pratensis*, L. (tarnished plant bug) and *Adelphocoris rapidus*, Say (cotton leaf-bug) on cotton in Arkansas. The chief injury was caused in the early part of the season ; in the following months, however, the recovery was so nearly complete that the largest cotton crop recorded in the State was produced. If, however, the season had not been so favourable, a severe loss would have been incurred, and in view of the fact that such an outbreak may occur again, notes are given on the distribution, life-history and control of these three species, parts of which have been previously noticed [*R.A.E.*, A, xiv, 629–631 ; xv, 73, 74, etc.]. The bugs killed the terminals and the squares of the plants, and the fruit failed to set, but a number of new terminals were thrown out. Where, however, the terminals were not killed and the stripping of the squares continued, the plants frequently grew tall with ill-developed branches. The injury caused by the three species in the cage was identical, but *L. pratensis* and *A. rapidus* attacked larger squares than *P. seriatus.* During 1926 the bugs were most abundant in the first month after the setting of squares began ; a survey in various parts of the State revealed approximately 30 per cent. injury in the area under cotton. Although the three species were widely distributed over Arkansas, damage was local ; *P. seriatus* is a poor flier and does not spread far from the centre of infestation, but the areas infested by the other two species are less clearly defined, since they are comparatively active fliers. The relative importance of the three species varied from field to field, the injury being most severe where *P. seriatus* was the dominant species, probably because it tends to concentrate its feeding. The only other plants recorded as attacked by it in Arkansas are *Croton* and evening primrose [*Oenothera*]. *L. pratensis* on the other hand is a well-known pest of a great variety of plants. *A. rapidus* breeds in large numbers on cowpeas and soy beans and appears to prefer these to cotton. The eggs of *L. pratensis* are laid in the flower buds of composites and hatch in about 10 days, the life-cycle from egg to adult being completed in 25 to 30 days ; the life-history and habits of *A. rapidus* are similar, both insects hibernating in the adult stage.

The most important natural enemy of these bugs on cotton in Arkansas appears to be *Geocoris punctipes*, Say, which was previously thought to be a pest of cotton ; spiders, mites, Coccinellids and Chrysopid larvae also feed on all three species.

The results of control measures were similar to those obtained in Texas ; it is probable that applications of sulphur dust made as soon as infestation is observed will be of the greatest value, and if several are needed, they should be applied at intervals of a week.

ISELY (D.). **The Striped Cucumber Beetle.**—*Bull. Arkansas Agric. Expt. Sta.*, no. 216, 36 pp., 2 pls., 36 refs. Fayetteville, Ark., February 1927.

This account of the bionomics of *Diabrotica vittata,* F., resembles, in the main, records previously noticed from other parts of the United States [*R.A.E.*, A, xiv, 76, 352, etc.]. Cantaloupe melons, cucumbers and watermelons are the crops that suffer most in Arkansas. A certain amount of soil moisture is necessary for oviposition and development ; for this reason the beetle is often of slight importance in upland fields, while it may be quite a serious pest in adjacent lowlands. There are two full generations a year in Arkansas, and individuals of a third and fourth were reared in the unusually long season of 1925. From 40 to 45 days are required for development from egg to adult under favourable conditions in midsummer ; late in the season the period is much longer. The Tachinid, *Chaetophleps setosa*, Coq., may parasitise as many as 45 per cent. of the beetles present in a field. If conditions favourable to the beetle can be avoided, direct control is seldom necessary. Planting an excess of seed enables the crop to withstand a sudden attack of the beetles, and screen covers can be used to protect seedling plants. When beetles invade a field of cucurbits, however, insecticidal treatment is necessary. When the beetle is not too abundant, spraying with 2 lb. lead arsenate to 50 gals. of water or Bordeaux mixture gives a fair degree of protection, and certain dusts are recommended as being more effective in dry weather [*R.A.E.*, A, xiv, 353, 474]. Arsenicals, however, act as repellents and actually kill very few beetles. Nicodust, containing 4 per cent. of nicotine, kills many beetles at summer temperatures, but is less effective in the spring, and the protection it gives is by no means permanent. Sodium fluosilicate and calcium fluosilicate are the only insecticides that kill the beetles and also protect the plants for some days against migrating beetles. The former is the more effective, but even when it is diluted with two parts of lime, occasional injury to the plant may result. Calcium fluosilicate has been used only in the form of a compound containing about 20 per cent. of the insecticide, and no injury has been observed following its use.

SMITH (R. C.). **The Courses in Entomology offered in American Colleges.**—*Kansas State Agric. Coll. Bull.*, xii, no. 1, 23 pp., 11 refs. Manhattan, Kans., January 1928.

In addition to a brief historical account of the teaching of entomology in the colleges and universities of the United States, tables are given classifying the various courses now offered and indicating the institutions where the particular courses may be taken.

Summary for 1927.—*Insect Pest Surv. Bull.*, vii, no. 10, pp. 379–399, multigraph. Washington, D.C., U.S.Dept.Agric., 1927.

This is a review of the more important insect conditions in the United States and Canada during 1927, including certain pests on which special investigations have been carried out by the the United States Bureau of Entomology and which were not dealt with in the monthly numbers of the Survey Bulletins, *viz.*, the European corn borer [*Pyrausta nubilalis*, Hb.]; *Hypera variabilis*, Hbst. (*Phytonomus posticus*, Gyll.) (alfalfa weevil); *Anastrepha ludens*, Lw. (Mexican fruit-fly); the oriental fruit moth [*Cydia molesta*, Busck]; *Popillia japonica*, Newm. (Japanese beetle); *Epilachna corrupta*, Muls. (Mexican bean beetle); *Listroderes obliquus*, Gyll. (vegetable weevil); *Eutettix tenella*, Baker (beet leafhopper); *Diatraea saccharalis*, F. (sugar-cane borer); *Porthetria dispar*, L. (gipsy moth); *Stilpnotia salicis*, L. (satin moth); and *Cnidocampa flavescens*, Wlk. (oriental moth).

HUBER (L. L.), CAFFREY (D. J.), U.S. Bur. Ent., & NEISWANDER (C. R.). **The Trend of European Corn Borer Research.**—*Bi-m. Bull. Ohio Agric. Expt. Sta.*, xiii, no. 1, pp. 3–8. Wooster, Ohio, January–February, 1928.

Neither the introduction of parasites nor the use of insecticides has as yet given very marked success in the campaign against the European corn borer [*Pyrausta nubilalis*, Hb.], though both are still the subject of exhaustive research. The present status of both in this connection is discussed. Mechanical destruction has produced the best results, and the regular carrying out of clean farming practices, such as low cutting of maize, ensilage, ploughing, etc., has undoubtedly reduced the degree of infestation wherever followed. One of the most important reactions of the borer to its environment is its response to the time of planting maize. The later that maize is planted, the fewer borers it will contain, and if the whole environment of the insect could be modified by later planting, an appreciable loss would be avoided. It is hoped that by continued efforts in all the practical phases of research it will ultimately be possible to grow maize profitably in spite of the presence of *P. nubilalis*.

NEISWANDER (C. B.), CONREY (G. W.) & HUBER (L. L.). **Soil Type Influences European Corn Borer Accumulation.**—*Bi-m. Bull. Ohio Agric. Expt. Sta.*, xiii, no. 1, pp. 8–12. Wooster, Ohio, January–February 1928.

The indirect influence of soil conditions and soil types on accumulations of the European corn borer [*Pyrausta nubilalis*, Hb.] is discussed. Investigation in Ohio has shown that the borer appears in numbers only where the soil is most favourable for maize growing. The response of the moths to maize depends largely on the stage of development of the plant at the time of oviposition, which, again, is dependent on the degree of soil fertility. The types of soil favourable to maize growing are discussed. In general, infestation in eastern Ohio should be less serious than in the western part of the State, as it habitually produces poorer maize.

International Corn Borer Investigations. Committee Report.—*Internat. Live Stock Expos.*, 19 pp., 16 figs. Chicago, December 1927.

The situation with regard to the European corn borer [*Pyrausta nubilalis*, Hb.] in Canada, the United States and Europe is reviewed, and the work of the committee for International Corn Borer Investigations is described. In Europe, the borer is known in all regions where maize is grown, and it occurs as far north as southern Sweden. In France and Italy there are two generations a year, but only one in the Danube basin. It is not yet known whether this is due to the presence of different biological types or to climatic differences. The damage done is very variable in different years and regions, and local farm practices have great influence on the severity of attack. In Croatia, for example, most farmers clean up their fields completely and dispose of the maize stalks as fodder and fuel, and thus reduce borer incidence to a minimum, while a few hundred miles further east the maize stalks are mostly left in the fields with resultant heavy losses. The insect is very susceptible to weather conditions and does not thrive in extreme dryness. One of the principal objects of the present research is to master some of the factors that control the life and development of the borer; in this connection some investigations have already been recorded [*R.A.E.*, A, xvi, 52, 288, 300.] In European countries the loss from borer attack may be anything between 5 and 20 per cent.; if the infestation in the United States is allowed to spread to the main maize-growing region (Iowa, Illinois, Missouri and Indiana), the loss will be very great. A 5 per cent. loss of the maize crop in Indiana would amount to about £2,000,000, and in Iowa it would be about £4,000,000. As maize is America's most important crop, unceasing efforts and, if necessary, unlimited funds should be employed for the discovery and application of successful methods of controlling *P. nubilalis.* At the present time, the only known remedy is to burn and plough under the infested stalks remaining in the field, but this practice is useless without the co-operation of all farmers, and this is very difficult to obtain. It is hoped that some better solution of the problem may be forthcoming, and to that end fellowships for corn borer research have been established at ten European institutions

MÉTALNIKOV (S.) & TOUMANOFF (K.). **Recherches expérimentales sur l'infection de** *Pyrausta nubilalis* **par des champignons entomophytes.**—*C.R. Soc. Biol.*, xcviii, no. 8, pp. 583–584, 3 refs. Paris, 2nd March 1928.

Numerous experiments were carried out in France on the infection of the larvae of *Pyrausta nubilalis*, Hb., with the entomogenous fungi, *Aspergillus flavus*, *A.* (*Sterigmatocystis*) *niger*, *Isaria farinosa* and *Beauveria* (*Botrytis*) *bassiana*. *A. flavus* proved to be the most effective, giving a mortality of 100 per cent. ; *I. farinosa* and *B. bassiana* were also very virulent, while *A. niger* was less so. The caterpillars were easily infected either by placing them in contact with sporulating cultures, by dusting them with spores or by dusting the stems of the *Artemisia* on which they were feeding, even in the absence of humidity. In experiments with *P. nubilalis* and *Galleria mellonella*, L., the larvae of the former were always much more susceptible than those of the latter. Four typical experiments are described.

On examination of the caterpillars it was found that the fungus was always in the general cavity and that infection takes place through the integument, this being the only mode of infection as yet observed.

WILDER (M. C.). **Observations on the Ichneumon-fly,** *Epiurus pterophori* **Ashmead.**—*Psyche*, xxxiv, no. 6, pp. 227–229, 1 fig., 3 refs. Boston, Mass., December 1927.

An account is given of the bionomics of *Epiurus pterophori*, Ashm., found parasitising the pupae of *Lophoptilus eloisella*, Clem., in stalks of evening primrose (*Oenothera lamarckiana*) in New York State. This Ichneumonid is a parasite of various stem-boring and stem-gall-making Lepidoptera and Coleoptera, including *Pyrausta nubilalis*, Hb.

FISHER (W. S.). U.S. Bur. Ent. **New Cactus Beetles. II.**—*Proc. Ent. Soc. Wash.*, xxx, no. 1, pp. 1–7. Washington, D.C., January 1928.

The following new species of beetles on *Opuntia* are described from Mexico and the West Indies: *Moneilema opuntiae*, *M. vittata*, *M. rugosipennis*, *Gerstaeckeria elegans* and *G. unicolor*, all from Mexico; *G. insulana* from Haiti; and *G. cubaecola* from Cuba.

MUESEBECK (C. F. W.). U.S. Bur. Ent. **A new European Species of** *Apanteles* **parasitic on the Gipsy Moth.**—*Proc. Ent. Soc. Wash.*, xxx, no. 1, pp. 8–9. Washington, D.C., January 1928.

Apanteles porthetriae, sp. n., sometimes a very important parasite of *Porthetria dispar*, L., is described from specimens obtained during a severe outbreak of the gipsy moth in Hungary and reared in the laboratory in May 1926. This species, which is widely distributed in Europe, has been confused with *A. vitripennis*, Haliday, and to a less extent with *A. lateralis*, Haliday, and *A. solitarius*, Ratz. It was found to be an abundant parasite, usually emerging from the third instar larvae.

McGregor (E. A.). U.S. Bur. Ent. **Descriptions of two new Species of Spinning Mites.**—*Proc. Ent. Soc. Wash.*, xxx, no. 1, pp. 11–14, 2 pls. Washington, D.C., January 1928.

Tetranychus californicus, sp. n., is recorded as almost defoliating *Populus fremonti* in California.

Peirson (H. B.). **Manual of Forest Insects.**—*Bull. Maine Forest Serv.*, no. 5, 130 pp., 10 pls., 1 fig., refs. Augusta, Me., 1927.

A general survey is made of the insects injurious to forest trees in New England. After a brief discussion of the various factors affecting the growth of a tree, the pests are dealt with individually under the trees they attack. The descriptions of the insects and of the damage caused by them have been made as little technical as possible. When detailed studies have been made of an insect, methods of forest management have usually been found that will largely prevent injury. It is important that insect attacks should be dealt with before they reach epidemic proportions. In the majority of cases the methods of control still consist in cutting the infested area. Measures for use against insects under shade tree conditions are also given.

Burke (H. E.). **The Western Cedar Pole Borer or Powder Worm.**—*Tech. Bull. U.S. Dept. Agric.*, no. 48, 15 pp., 9 figs., 38 refs. Washington, D.C., February 1928.

The Buprestid, *Trachykele blondeli*, Mars., injures hundreds of the finest western red cedars (*Thuja plicata*) in the Pacific Coast region of Oregon, Washington and British Columbia, by boring through the sapwood and heartwood until the timber is almost worthless for higher grade uses, such as furniture, shipbuilding, etc., and though infestation apparently detracts little from its use for fencing, posts, poles and other constructional purposes, the price for these is lowered, and the manufacturer suffers severe losses. The history, distribution and economic importance of the insect are discussed. Various species of cypress (*Cupressus*) and western juniper (*Juniperus occidentalis*) are also severely infested. The stages of the beetle are described. The adults from cedar are generally darker and duller than those from cypress, while those from juniper are more delicate, more brilliant in colouring, and generally rather smaller. The author considers that the beetles from the juniper in the mountain districts of eastern California and probably in Nevada, Utah, Arizona and New Mexico should be separated as a subspecies from those that occur in cypress and cedar along the coast of Oregon, Washington and British Columbia, and this subspecies is described as *T. blondeli juniperi*, subsp. n. The food habits of the adults of *T. blondeli* have not been observed, but they probably feed on the leaves of trees and live throughout the summer. The eggs are probably laid in or under the bark where it is cracked or has peeled off.

The young larva mines down into the wood and, if in a branch, through it to the trunk; it then bores, generally following the layers of wood vertically or transversely, but sometimes cutting through these to get closer to the surface or nearer to the heartwood. Each completed mine terminates in an enlarged pupal cell, which is connected with the outer surface by an oval exit hole made by the adult when emerging. The borings in juniper are slightly different; the egg is laid on a small branch, and the larva mines down to the trunk and backwards and forwards in it until mature, when it tunnels out into a branch again where it pupates; the trunks of juniper are often merely a mass of worm-holes. There is generally little indication of damage until the timber is felled and cut, though sometimes the exit holes made by the beetles are visible. The injury is frequently common in certain localities and absent in others. The life-cycle occupies at least three years. The adults emerge in spring and oviposit in summer; the young larvae appear in summer and continue feeding for rather more than two years, with perhaps a dormant period during the coldest weather of winter, pupating and transforming into adults in the third autumn. The adults spend the third winter in the pupal cells and emerge in the following spring. Larvae of various sizes are thus found in the wood at all seasons of the year. No parasites or diseases were observed. Large larvae of the Trogositid, *Temnochila chlorodia*, Mann., were commonly found under the bark and in mines in the wood of *Thuja* in Washington, and were apparently predacious on the larvae of *T. blondeli*. Under present conditions of forest management, the only practical method of controlling loss is to use the injured material for purposes for which it is best suited. Where unblemished material is required, timber should be obtained from a district that is known to be free from *T. blondeli*.

STRAND (A. L.). **A Comparison of the Toxicity to Insects and the Diffusion in a Column of Grain of Chloropicrin, Carbon Disulphide, and Carbon Tetrachloride.**—*Tech. Bull. Minnesota Agric. Expt. Sta.*, no. 49, 59 pp., 12 figs., 3 pp. refs. St. Paul, Minn., October 1927.

The first part of this bulletin deals with the toxicity of these gases to insects, and the second part with their diffusion in grain. In each case the literature on the subject is briefly reviewed, the methods and apparatus used during the experiments are described in detail and the results are discussed, the details being given in the form of tables in an appendix at the end of the paper.

The following is taken from the author's summary: The toxicity of these gases can be correctly compared only when time, temperature and concentration are taken into consideration. Throughout a range of temperatures from 35–10° C. [95–50° F.], 1 lb. chloropicrin (CCl_3NO_2) (to 1,000 cu. ft.) is more toxic to *Tribolium confusum*, Duv. (confused flour beetle) than 20 lb. carbon tetrachloride (CCl_4), and the lower the temperature, the greater the relative toxicity; but it is less toxic than 15 lb. carbon bisulphide (CS_2). The greater the concentration of chloropicrin (between 1 and 3 lb.) the better is its toxicity to insects maintained through a range in temperatures from 35 to 10° C. A decrease in temperature lowers the toxicity of carbon tetrachloride much more rapidly than that of carbon bisulphide or chloropicrin. Between 35 and 10° C., the length of time taken to kill 100 per cent. of *T. confusum* with any of the gases increases at a greater rate toward the lower temperatures. When chloropicrin or carbon bisulphide is applied to wheat in a tight bin, the downward diffusion of the gas is not so rapid as is usually described. The concentration of the gases does not become stronger towards the bottom of the bin than towards the top, but varies inversely with the depth below the surface of the grain, adsorption by the top layers of grain preventing the rapid downward movement of the gases. Since adsorption increases when temperature decreases, temperature is an important factor in the fumigation of grain apart from its relation to toxicity of the fumigant or the activity of the insect being fumigated.

BULGER (J. W.). **Studies on Elemental Sulfur as a Soil Insecticide.**—*Ohio J. Sci.*, xxxviii, no. 1, pp. 1–42, 3 pls., 8 refs. Columbus, Ohio, January 1928.

Investigations have been carried out with the object of discovering a soil insecticide that will at the same time act as a fertiliser, and extensive experiments were made with two forms of elemental sulphur, inoculated sulphur and flour of sulphur, which have been found to have value as fertilisers, to determine their effect and that of their transitional products on insects feeding in the soil. The following is taken from the author's summary: Though sulphur dioxide and sulphuretted hydrogen were experimentally considerably toxic to ants (*Formica fusca subsericea*, Say), it is improbable that these substances could be readily produced in the soil in sufficient quantities to be of insecticidal value. Sulphurous acid and sulphuric acid were also toxic when a large enough amount was applied to soil in which there were ants' nests, but this amount was greater than could be easily obtained through the oxidation of sulphur in the soil. Ants, larvae of *Lachnosterna* (*Phyllophaga*), wireworms and cutworms can live for a considerable time in soils with an acidity as great as that indicated by a pH value of 2·8; this rate of acidity would kill almost all the vegetation in the soil, and even where the initial reaction was decidedly acid, would be attainable only through the use of more than 2,000 lb. of sulphur to an acre. Ants do not appear to be attracted to, or repelled from, nesting in a soil until its pH value is less than 2·8. Flour of sulphur and inoculated sulphur did not seem to be toxic to ants, *Lachnosterna* or larvae of *Phorbia* (*Hylemyia*) *cilicrura*, Rond. (*fuscipes*, Zell.) and *P.* (*H.*) *brassicae*, Bch., nor did these substances exert any appreciable influence in soils in which vegetable crops were grown, apparently increasing the maggot infestation of turnips and radishes, although this has not been definitely proved. Sulphur was not effective against the black peach aphis (*Anuraphis persicae-niger*, Smith) and was very detrimental to young peach trees. It injured plant growth in soils that had a pH value of less than about 6·0 before treatment, while it was of no use as a carrier of insecticides such as nicotine sulphate or carbon bisulphide. It would therefore seem that elemental sulphur is unlikely to be of any value as a soil insecticide.

Roark (R. C.). **Reviews of United States Patents relating to Insecticides and Fungicides issued from April 1926 to November 1927.**—14, 10, 15, 14, 21, 24, 9, 14 pp., multigraph. Washington, D.C., U.S.Dept. Agric., Bur. Chemistry & Soils [1926–1927].

Abstracts of the patents relating to insecticides and fungicides issued from the beginning of April 1926 to the end of November 1927 are given [*cf.* *R.A.E.*, A, xiv, 628]. This publication, previously issued once a quarter, was issued monthly after September 1927.

Strickland (E. H.). **Wireworms of Alberta. A Preliminary Report.** —*Res. Bull. Coll. Agric. Univ. Alberta,* no. 2, 18 pp., 3 figs. Edmonton, Alberta, June 1927.

The most widespread damage to cereals on the Canadian prairies is caused by the larvae of *Corymbites* (*Ludius*) *aeripennis*, Kby. (northern prairie wireworm), and in the more northern part of Alberta, where losses have been very severe, it appears to be the only wireworm of any economic importance. In the extreme southern portion of Alberta and Saskatchewan, however, more severe losses are caused by a small wireworm, apparently a species of *Agriotes*, while a certain amount of damage must be attributed to larvae of the Tenebrionid, *Eleodes hispilabris*, Say. All the species of *Eleodes* that occur in Alberta have a two-year life-cycle. The eggs are laid during June, and the larvae are about half-grown by the time that the autumn frosts occur. They pupate in the following August, and the adults emerge before the end of the month and feed on weeds. The beetles apparently hibernate chiefly under dense collections of weeds, and the larvae are liable to be present in destructive numbers in fields that two years previously were heavily infested with weeds.

All stages of *C. aeripennis* are briefly described. The beetles appear above ground in April or early May when the air temperature is slightly above 50° F. (the optimum temperature for their activity is about 65° F.), but when the temperature of the soil surface rises to 82° F. or higher, they again burrow down to the cooler soil beneath. Pairing occurs a few days after the beetles come to the surface. It seems probable that they never fly, although they have fully developed wings. In the garden they fed freely on recently cut potato sets and in the laboratory on carrots and beets, but their food-plants in the field are not known, though it has been proved that females will lay fertile eggs when they have had access to no other food than that which they can obtain from moist soil. Oviposition may begin early in May, but is not general until about the middle of June, the majority of eggs being laid before 30th June. In captivity under unfavourable conditions the eggs may be retained until nearly the end of July, after which the beetles die. When conditions of soil texture permit, the beetle burrows to a depth of 5–6 inches before scattering its eggs promiscuously in the soil. On the other hand, its legs are not adapted to enable it to dig into firm soil, and in field cages it was found that eggs were laid as near the surface as one inch if the soil has not been loosened to a greater depth, always provided that the soil at this depth had a moisture content of not less than 5 per cent. The presence or absence of vegetation appears to have no effect on the selection of oviposition sites, though the requirements of soil texture result, in the field, in the majority of eggs being laid in soil destitute of all vegetation. It is estimated that each female lays about 350 eggs; these are not all laid at the same time, although the majority are deposited on the first day.

Under laboratory conditions the minimum duration of the egg stage was about 20 days. Few larvae had reached the third instar by 3rd September, and very few of these had reached the fourth instar when the field cages were examined in the following April. It is believed that the time required for the larvae to reach maturity is three to four years according to the individual. Maturing larvae are found at a depth of 6 inches or more, but most of the pupae occur at a depth of 3–4 inches. The first pupa was found in the field on 16th July, and all larvae about to pupate had done so by the end of the same month. Adults emerged between 1st and 30th August, but remained dormant until the following spring.

C. aeripennis appears to be almost free from parasitic enemies, although indirect evidence was obtained that various species of small Carabids feed on the larvae. It was found, moreover, that earlier in the season, the larvae of these beetles are as frequently eaten by wireworms as the wireworms are by them.

All the observations made indicate that the most critical period in the life-history of this beetle is that during which it is still in the egg or first larval stage. Where the soil is uncultivated or not deeply cultivated, the beetles will oviposit at a depth of less than two inches, and there is every chance that the soil will become dried out and the eggs desiccated at some time during the period of about a month before they hatch, eggs deposited at the normal depth of five or more inches being largely protected from this danger. First stage larvae liberated in soil that has a moisture content of 2 per cent. or less come rapidly to the surface, where they soon perish. This reaction is far less pronounced in the more advanced stages. On the other hand first and second stage larvae will live, feed and even moult under water. The scarcity of wireworms in unbroken prairie may therefore be explained by the rareness of opportunities for the beetle to deposit its eggs at a depth that would assure their survival. Laboratory observations indicate that by keeping summer fallow absolutely bare of vegetation from early July until the end of August it might be possible to starve out the newly-emerged larvae, even though those that are more mature can live for an entire season without living vegetation for food. Since the beetles are non-migratory, the infestation in a given field must be attributed to conditions that have existed in it during recent years, and records of the past history of cultivation in various fields support the theory, practically without exception, that deep cultivation before the end of June is responsible to a greater extent than any other factor for the prevalence of *C. aeripennis*.

It is therefore suggested that deep spring and early summer cultivation should be reduced to a minimum; and that prior to 15th July the surface soil of summer fallow fields should be cultivated as often as is necessary to a depth of not more than 2½ inches in order to destroy weeds and thereby to conserve moisture below the depth of cultivation. If the field be ploughed to a depth of not less than six inches during the latter part of July, most of the pupae will be destroyed. By this method it should be possible to exterminate practically two generations of wireworms in a single season under normal climatic conditions, but larvae one, two or three years old are not affected and no immediate relief can be expected. Infested fields should be more heavily sown.

Shallow sowing encourages rapid germination and reduces loss provided that the top layer of soil is sufficiently moist. Late sowing reduces wireworm damage in normal seasons, and cross packing the drill rows with a heavy ridged packer prevents the wireworms from moving easily along the rows. Oats are not attacked so severely as wheat, while flax does not appear to be entirely immune.

MITCHENER (A. V.). **Optimum feeding Temperatures for the Dark-sided Cutworm,** *Euxoa messoria* **Harris.**—*Sci. Agric.*, viii, no. 6, pp. 370–375. Ottawa, Ont., February 1928.

Considerable damage was done during 1925 and 1926 to cereals, flax and garden plants on the Canadian prairies by several species of cutworms. *Euxoa ochrogaster*, Gn. (red-backed cutworm) was the dominant species in 1925, but in 1926 it was almost entirely replaced by *E. messoria*, Harr. (dark-sided cutworm), when *Polia lorea*, Gn., was also common, especially on lucerne at Winnipeg. This species, which appears as a partly grown larva as soon as any food is available, ceased feeding about the middle of May in 1926, so that it is improbable that it will ever become very destructive to cereal crops. *E. messoria* was first noticed as very small larvae in the middle of May and continued feeding until about the fourth week in June, so that it is capable of causing severe injury to field and garden crops. With a view to using poison baits at night when feeding occurs, an investigation was undertaken to determine the optimum temperatures for feeding. The experiments were carried out almost nightly from 13th May to 12th June with over 4,000 larvae of *E. messoria*, which were fed on fresh lucerne stems and leaves. From 16th till 27th May the largest amounts of food were consumed at temperatures between 34° C. [93·2° F.] and 39° C. [102·2° F.], so that the higher the temperature becomes during May, the more the cutworms will eat ; from 28th May until 9th June the optimum feeding temperatures were 20–25° C. [68–77° F.]. Most food was consumed between 1st and 8th June, and although the larvae continued feeding until 27th June, very little was consumed towards the end of the period.

An attempt was also made to determine the time required for poisons in baits to kill the cutworm. The maximum number of deaths occurred on the 4th and 5th days with Paris green and on the 5th and 6th days with calcium arsenate.

KELSALL (A.) & HERMAN (F. A.). **The Persistence of a poisonous Residue on Foliage sprayed with Nicotine Sulphate.**—*Sci. Agric.*, viii, no. 7, pp. 465–466. Ottawa, Ont., March 1928.

Observations made during the past few years indicate that sprays of commercial nicotine sulphate (40 per cent. nicotine) leave a fairly persistent residue that may be of considerable consequence. One of the methods of controlling *Eucosma* (*Spilonota*) *ocellana*, Schiff., on apple consists in spraying the lower surface of the leaves with nicotine between 15th July and 10th August, just prior to or shortly after the hatching of the eggs, but it has been repeatedly demonstrated that nicotine applied long before the eggs are present, and even before the adults make their appearance, will kill newly hatched larvae several weeks or even a month later. Thus, in one typical experiment the trees were sprayed with nicotine sulphate (1 qt. to 100 gals.) on

1st July and although hatching did not commence until 19th July, examination on 10th August showed an average of 18 living larvae to each 100 leaves compared with 132 on untreated trees. The sprays applied did not deter the moths from depositing their eggs on the treated areas, as many eggs being laid on the sprayed as on the unsprayed trees. These eggs hatched in a normal manner, but the larvae died shortly afterwards. The same has been found to hold good whether nicotine sulphate is used alone or in combination with casein-lime, hydrated lime, Bordeaux mixture or lime-sulphur, though it has not been ascertained whether the residue persists equally in all these mixtures. Chemical determinations showed that the nicotine found on the leaves a few days after spraying was in the neighbourhood of 5 per cent. of that originally applied.

Ross (W. A.). **The Lubricating Oil Spray Situation in Ontario.**—*Canad. Hortic.*, Fruit & Truck edn., li, no. 2, pp. 25–26, 4 figs. Peterboro, Ont., February 1923.

This paper discusses home-made lubricating oil emulsions, the type that has proved most satisfactory in Ontario for spraying dormant trees being made with cheap red paraffin oil having the following characteristics: gravity at 60° F., 24 to 26 A.P.I.; flash point (open cup) 360° F. (minimum); viscosity at 100° F., 170 to 220 seconds (Saybolt); volatility (loss at 105–110° C. [221–230° F.] after 4 hours), 0·41 per cent.; pour and solid, 40–35° F. After various tests the most generally satisfactory emulsifier proved to be copper sulphate and lime. The effect of the oil on trees is discussed, and some account is given of the results secured by spraying in orchards, the insects against which the sprays have been successfully used being the pear psylla [*Psylla pyricola*, Först.], the European red mite [*Paratetranychus pilosus*, C. & F.], the black cherry aphis [*Myzus cerasi*, F.] and the San José scale [*Aspidiotus perniciosus*, Comst.], for which a 3 per cent. strength proved adequate, and the fruit-tree leaf-roller [*Tortrix argyrospila*, Wlk.], against which a 6 per cent. spray should be applied before the buds burst. A 4 per cent. spray diluted in 2 : 2 : 40 Bordeaux mixture proved effective in experimental work against the cottony peach scale [*Pulvinaria* (?) *amygdali*, Ckll.].

Box (H. E.). **Los parásitos conocidos de la especies americanas de** *Diatraea* **(Lepidoptera, Pyralidae).** [The recorded Parasites of the American Species of *Diatraea*.]—*Rev. ind. agríc. Tucumán*, xviii, no. 5–6, pp. 53–61, 6 refs. Buenos Aires, October–November 1927; also *Bol. Estac. exp. agríc. Tucumán*, no. 5, 9 pp. Buenos Aires, 1928.

Of the Pyralid moths of the genus *Diatraea* that are pests of sugarcane, only *D. saccharalis*, F., is known at present to occur in Argentina, where its distribution extends from the extreme north southwards to Buenos Aires. It is also a serious pest of maize. In the province of Tucumán the first adults appear in October, and four generations occur before hibernation at the end of April. A list is given of the 37 parasites of *Diatraea* spp. recorded in America, with notes on their hosts and distribution; those occurring in Argentina are the Chalcid, *Trichogramma minutum*, Riley; the Braconids, *Ipobracon tucumanus*, Brèthes, and *Microdus crossi*, Brèthes; *Sarcophaga diatraeae*, Brèthes; and probably the Proctotrupid, *Prophanurus alecto*, Crawf.

ABBOTT (E. V.). **La enfermedad del "Mosaico" de la caña de azucar.** [Sugar-cane Mosaic.]—*Estac. exp. agric. Soc. nac. agrar.*, Circ. 5, pp. 3–9, 1 pl. Lima, January 1928.
TOWNSEND (C. H. T.). **Notas sobre el** *Aphis maidis.*—*Op. cit.*, p. 10.

In view of the discovery of mosaic disease of sugar-cane in Peru, an account is given of the disease, its distribution and control, together with a note on *Aphis maidis*, Fitch, the only insect vector known at present.

IBARRA (R. A.). **El "mosaico," "matizado" o "rayas amarillas" de la caña de azucar.** [Sugar-cane Mosaic.]—55 pp., 6 figs. Caracas, Minist. Fomento, Venezuela, 1927.

The occurrence of sugar-cane mosaic in Venezuela was observed in 1927. An account is therefore given of the disease and of the measures that are taken against it. It is pointed out that this disease may be due to the use of infected plant cane, the only known insect vector being *Aphis maidis*, Fitch.

Para combater a "broca da raiz" do algodão. [A Method against the Root Borer of Cotton.]—*Chacaras e Quintaes*, xxxvii, no. 2, p. 161. S. Paulo, 15th February 1928.

A method of sowing cotton, to be used if infestation of the roots by the weevil, *Gasterocercodes gossypii*, Pierce, is probable, has been described by H. A. Tavares. The cotton is sown in continuous rows, which are then thinned so as to leave spaces of 8 inches. If the pest does not appear, the plants are left untouched, but if infestation occurs, the infested plants are uprooted, so that ultimately the plants in the field will be irregularly spaced. If the usual method of having plants at intervals of 32 inches is practised, the removal of infested plants will leave unnecessarily large gaps.

MOREIRA (C.). **Insectos nocivos ao cafeeiro no Brasil.** [Insects injurious to the Coffee Plant in Brazil.]—*Rev. Soc. rur. brasil.*, viii, no. 92, pp. 24–25. Rio de Janeiro, January 1928.

Up to 1924 no really serious coffee pest had been recorded in the state of S. Paulo; the Scolytid, *Stephanoderes hampei*, first noticed at that time, was introduced from the Dutch East Indies. At first it was confused with another species, *S. seriatus*, which infests the pericarp and does not bore into the beans, and a distribution greater than its actual one was therefore attributed to it in S. Paulo. Owing to its slow natural spread and to the measures taken by the Federal and State governments, the infestation has been limited to the original areas.

Other pests include *Corthylus flagellifer* and *Xyleborus retusus*, which bore into the branches of coffee; two Homoptera, *Carineta fasciculata* and *Fidicina* sp., which infest the roots; and the Aphid, *Toxoptera aurantii*, which is usually found on orange but sometimes attacks the leaves of coffee. Eleven species of Coccids occur on coffee in Brazil, *viz.*, *Alecanochiton marquesi*, *Eriococcus coffeae*, *Pseudococcus citri*, *P. cryptus*, *Paralecanium* (*Eulecanium*) *marianum*, *Saissetia hemisphaerica*, *Howardia biclavis*, *Selenaspidus articulatus*, *Ischnaspis longirostris*, *Cerococcus parahybensis* and *Coccus viridis*. Of these the last two are the most dangerous. The Mediterranean fruit-fly, *Ceratitis capitata*, oviposits in the pericarp of the berries, but does not injure the beans. The caterpillars of *Eacles magnifica*, *Megalopyge lanata* and *Leucoptera coffeella* attack the leaves. *Auximobasis coffeella* infests withered berries lying on the ground, and *Myelois solitella* and the Anthribid, *Araecerus fasciculatus*, occur in withered berries both in the open and in stores.

Un dangereux ennemi des prunées en Algérie : le *Capnodis tenebrionis*. —*Rev. hortic. Algérie*, xxxii, no. 1, p. 21. Algiers, January 1928.

The cultivation of plums is an extensive and increasing industry in Algeria, but it is severely handicapped by the occurrence of the Buprestid, *Capnodis tenebrionis*, L., which bores between the wood and bark of the trunk, constructing galleries that are easily discernible. The attacks of these larvae cause rapid death of the tree.

MERCET (R. G.). **Calcídidos africanos y de la isla de Madera.** [Chalcidids from Africa and Madeira.]—*Eos*, iii, no. 4, pp. 490–499, 4 figs. Madrid, 31st December 1927.

The species dealt with are: *Aphytis* (*Aphelinus*) *chrysomphali*, Mercet (*quaylei*, Rust, *limonus*, Rust) bred from *Aspidiotus destructor*, Sign., *Azotus stylatus*, sp. n., and *Physcus paolii*, sp. n., from *Selenaspidus articulatus*, Morg., *Coccophagus* (?) *trifasciatus*, Compere, from *Lecanium* sp., and *Leptomastix longipennis*, sp. n., taken on mulberry leaves infested by *Pseudococcus* sp., in Italian Somaliland; *Prospaltella diaspidicola*, Silv. (*niigatae*, Nak.) bred from an undetermined Coccid, in S. Africa; and *Coccophagus* (?) *nigrifrons*, Wollaston, from *Coccus hesperidum*, L., *Signiphora aleyrodis*, Ashm., from *Chrysomphalus dictyospermi*, Morg., *Arrenophagus chionaspidis*, Auriv., from *Diaspis zamiae*, Morg., *Euaphycus flavus*, How., from *C. dictyospermi*, and *Eucomyx infelix*, Embleton, from *Coccus hesperidum*, in Madeira.

Notes on the distribution, hosts and affinities of some of these species are given.

GHESQUIÈRE (J.). **Note sur** *Inesida leprosa*, **Lamiide nuisible au chêne d'Afrique** (*Chlorophora excelsa*) **et au mûrier cultivé.**—*Rev. zool. afr.*, xv, fasc. 4, pp. [93]–[94], 1 fig. Brussels, 15th February 1928.

The Lamiid, *Inesida leprosa*, F., which is common in the forests of the Belgian Congo, attacks cultivated mulberry as well as *Chlorophora excelsa*, while reared adults were also fed on the bark of *Ficus*. The larvae make galleries under the bark and later bore into the wood, where they pupate. Oviposition takes place at night, 40–50 eggs being laid over a period of about a week. The females prefer thick to thin bark under which to deposit their eggs. The adults never feed on the parts of the branches where the eggs are laid, but they have been observed to cut them off in the case of mulberry trees, though not in the case of *Chlorophora*. The eggs hatch in about a month, and approximately 22 per cent. fail to develop. The larvae are parasitised by the Braconid, *Stirostoma longicornis*, Cam., which has an ovipositor about 4 ins. long that it is able to insert into the galleries of *I. leprosa* and so reach the larvae.

Schouteden (H.). **Un papillon parasite du sésame.**—*Rev. zool. afr.*, xv, fasc. 4, p. [107]. Brussels, 15th February 1928.

The Pyralid, *Antigastra catalaunalis*, Dup., is recorded from two localities in the Belgian Congo as injurious to *Sesamum.*

Dejong (E.). **Le coton dans l'Uelé (Congo belge).**—*Bull. agric. Congo belge*, xviii, no. 4, pp. 451–536, 61 figs. Brussels, December 1927.

In the short section (pp. 519–527) dealing with insects injurious to cotton in this district in the north of the Belgian Congo, brief notes are given on the bionomics and control of the following pests: *Sylepta derogata*, F., *Heliothis obsoleta*, F., *Earias biplaga*, Wlk., *Dysdercus nigrofasciatus*, Stål, the cotton aphis [*Aphis gossypii*, Glov.], termites and grasshoppers.

Appearance of Army Worm.—*Rhodesia Agric. J.*, xxv, no. 2, pp. 156–157. Salisbury, February 1928.

Laphygma exempta, Wlk. (army mystery worm) has recently been reported from two localities in Rhodesia, maize and other cereals and sometimes also ground-nuts and potatoes being liable to attack. The caterpillars may develop on cultivated lands or on the veldt, whence they invade cultivated crops. On the veldt they may be destroyed by spraying with locust poison, which contains 10½ lb. of sodium arsenite to the gallon, diluted in 200 parts of water, but on cultivated lands this would severely injure green plants. Good results have been obtained by stripping off the lower leaves of maize plants, dipping them in the diluted poison and distributing them along the rows in the early morning, close to, but not touching, the maize plants. The caterpillars are then shaken from the plants to the ground, and many become poisoned. If the maize is too small for this method, succulent grass could be used. Sugar or molasses added to the poison and distributed between the rows may add to the attractiveness of the bait. A formula suggested is 1 lb. sodium arsenite and 2 qts. cheap sugar or molasses to 16 gals. water, used on bran, finely cut grass or maize foliage. It is only during about the last 10 days of development that the caterpillars are very injurious, so that outbreaks are of short duration, but require the promptest of remedial measures. Two consecutive generations of *L. exempta* have never yet been recorded in the Colony in the same locality, nor two consecutive outbreaks of any magnitude within the Colony in one season. It is thought that the moths migrate for great distances before oviposition.

Arnold (H. C.). **Top Dressing of Maize against Stalk Borer.**—*Rhodesia Agric. J.*, xxv, no. 2, pp. 162–165, 1 fig.; also as *Bull. Dept. Agric. S. Rhodesia*, no. 674, 4 pp., 1 fig. Salisbury, February 1928.

The methods described in this paper against the stalk borer [*Busseola fusca*, Fuller] are not regarded as an alternative to such precautions as burning old stalks and roots during the winter and the planting of trap crops near the threshing floors, but they have been used with some success by the author as emergency measures on experimental plots. The young plants may be attacked as early as three weeks from the date of sowing, and successive generations of moths may appear over several weeks. Until the plants are 5 or 6 weeks old, little damage is done by cutting off their top leaves down to a point where they are folded closely together and below where the borers are feeding. As much as one-third of the plant may be removed in this way, and the tops can be used as fodder, buried in the field or deposited at least 100 yards from the growing crop. If the plants are more than six weeks old a proportionately smaller piece is cut off and the remainder of the plant treated with an insecticide in order to kill any grubs that may remain. Cooper's or some other carbolic dip may be used for this purpose, but not arsenical cattle dips, which destroy the plants. The fluid dips are diluted by 250 to 300 times their volume of water ; this will kill the younger larvae, but a stronger solution may be necessary against the mature ones. The liquid should be poured into the top of the funnel-shaped cup formed by the folded leaves until it is filled up so that all grubs not removed in the cut-off portion are killed. As an alternative, a pinch of a proprietary powder that liberates an insecticide gas can be scattered over the cup of folded leaves after the top is removed. All these preparations scorch the foliage more or less, but the plants soon recover if the solution is not too strong. A soil insecticide was tried and did not injure the foliage ; against young larvae on plants from 2 to 3 ft. high, it gave satisfactory results, but had little effect on older larvae. As the borers after the first few days travel downwards in the growing plant, sealing their tunnels as they go, later measures are apt to be more harmful to the plant than the pest itself. The value of these measures has been the subject of some discussion ; generally speaking, when the land is fertile and the infestation heavy, such measures are undoubtedly worth while, but when a light crop is expected, the expense may be too great. At the Salisbury Experiment Station, the combined topping and treatment with dips saved nearly 100 per cent. of the affected plants, but in the field one of these methods alone would probably be more economical, and treatment with an insecticide might be tried while the plants are young and the larvae less than half an inch long.

STOREY (H. H.). **Transmission Studies of Maize Streak Disease.**—*Ann. Appl. Biol.*, xv, no. 1, pp. 1–25, 1 pl., 6 figs., 11 refs. London, February 1928.

During investigations on streak disease of maize in South Africa and its insect vector, *Cicadulina* (*Balclutha*) *mbila*, Naude, an improved method of confining the feeding of the insects to single leaves of the plant was adopted. The apparatus consists of a circular steel spring, on one end of which is a pad, the other end being soldered to a short length of brass tubing, which holds a longer glass tube in which the insect is confined. The position of this tube can be fixed by a small screw so that a leaf can be held between its opening and the pad. The apparatus is supported by fixing the glass tube in a spring clothes peg, through the spring of which passes the tip of a piece of bamboo stuck in the earth near the maize plant.

The following is taken from the author's summary : Eggs laid by infective leafhoppers produced uninfective progeny, but the young leafhoppers might, at any stage of their development, become infective after feeding upon a diseased maize plant, the infective power being retained during moulting. Adults might become infective after feeding for one hour, though in a lower proportion than when the feeding period lasted for several days. Even when fed on a diseased plant from the first instar to the adult stage, a proportion of the insects remained uninfective, and experimental studies with these individuals led to the conclusion that no further periods of feeding on a diseased plant would make them infective. The progeny of such resistant females might, however, become infective.

A study of the infections produced by individual insects, when repeatedly transferred to fresh maize plants after short intervals of time, gave no indication of a cycle of alternating infective and uninfective periods in the insect. The frequency of infection was increased by high temperatures, but was not influenced by preliminary starving of the leafhoppers. The power of infection was usually retained throughout the life of the leafhopper, but one definite exception was observed. Experiments showed that the period of incubation of the virus in the insect was of variable duration, but was shortest at higher temperatures, the minimum period observed being 6–12 hours at 30° C. [86° F.]. The feeding of groups of insects caused infections more frequently, and, on the average, in less time, but not more quickly than the quickest of the individuals feeding alone.

It was found that the frequency of infection and the incubation period of the disease in the plant were affected by the temperature and the age of the plant, but not by soil moisture. Infection occurred as frequently when the insects fed on the upper or lower surface of the leaf and on the young or old leaves, although infection through a young leaf might cause the first symptoms to appear in an unusually short period. The passage of the virus down a leaf inoculated near its tip was not affected by certain forms of leaf mutilation, such as the cutting out of the main vein or the severing of the veins of half the lamina. This downward movement occurred at a rate exceeding 15¾ ins. in two hours. The virus was usually obtained by the leafhoppers feeding on the chlorotic areas but not from the green areas, except that a small proportion usually became infective after feeding on the leaf through which infection had taken place, and similarly a small proportion (perhaps due to experimental error) after feeding on the green areas lying between the chlorotic areas in the fully diseased leaf.

Storey (H. H.) & Bottomley (A. M.). **The Rosette Disease of Peanuts** (*Arachis hypogaea*, **L.**).—*Ann. Appl. Biol.*, xv, no. 1, pp. 26–45, 5 pls., 2 figs., 11 refs. London, February 1928.

A detailed account is given of an investigation into rosette disease of peanut (*Arachis hypogaea*) in South Africa begun in 1923 [*cf. R.A.E.*, A, xiii, 524 ; xv, 569]. The following is largely taken from the authors' summary : Experimental evidence shows that rosette disease is not carried in the seed of the peanut, nor in soil that has borne a diseased crop. It was successfully transmitted to healthy plants by grafting, but not by inoculation of juice from diseased plants. *Aphis leguminosae*, Theo., was shown to acquire the virus of the disease by feeding upon a diseased plant, and winged and wingless adults, when feeding singly, were shown occasionally to transmit the disease. Thirteen species of leafhoppers, in a limited series of tests, failed to act as vectors.

An infrequently occurring mosaic-like form of the disease is considered to be due to an exceptional reaction of individual plants to the same virus as that causing typical rosette.

In the field the virus is believed to overwinter in diseased plants that germinate in the late autumn and survive the drought and frost of winter. The Aphid was not discovered upon any wild plant in the peanut growing region, but small colonies were found on self-sown seedlings of *Arachis* in July and August, and it is, therefore, likely that the winter is passed in slow agamic reproduction on these plants. In some cases the Aphids may overwinter actually upon diseased plants, and in other cases diseased self-sown plants may be colonised in the spring. It is thought that in the spring infective winged Aphids settle on a young seedling and infect it with rosette ; and that later the disease is carried to adjacent plants by Aphids that have crawled from colonies established on this central diseased plant, causing localised infections. It is suggested that the epidemic spread of the disease that frequently occurs later in the season is a consequence of a general dissemination of winged Aphids of a later generation from colonies on infected plants of the early crop. The evidence gained from six years' peanut growing indicates that spring infection of rosette disease is most severe in seasons following winters of exceptional rains. In addition to recommendations already made for the control of this disease [xv, 569], the destruction of all surviving peanut plants during the winter is advised.

TATTERSFIELD (F.). **The Decomposition of Naphthalene in the Soil and the Effect upon its insecticidal Action.**—*Ann. Appl. Biol.*, xv, no 1, pp. 57–80, 1 fig., 4 diagrs., 8 refs. London, February 1928.

The following is largely taken from the author's summary : The insecticidal action of naphthalene and its duration in the soil have been studied. When naphthalene is incorporated thoroughly with soil, it shows a fairly potent toxic action on wireworms. Uneven distribution lessens its efficiency as, owing to its low vapour pressure and consequent slow spread, it produces only a small zone of toxic action ; moreover, its insecticidal action is slow, three or four days being required to kill wireworms, and since it also acts as a repellent, insects tend to move away from positions where toxic action would be exerted. The persistence of toxic action depends on the type of soil, toxicity disappearing rapidly in soil rich in organic matter and persisting longer in sterile soils and in sand than in unsterilised soils, and in dry than in moist soils. The rate of disappearance of naphthalene from the soil has been determined. It depends very little upon volatilisation, but almost entirely upon some factor, inherent in the soil, that is more active in soils rich in organic matter and in unsterilised soils. Second and third doses of naphthalene added to the soil when the first has disappeared are decomposed more rapidly than the first dose. The numbers of bacteria in the soil are at first decreased by the addition of naphthalene, indicating a selective toxic action on part of the bacterial flora, but there is a rapid rise in the numbers during the period when acceleration of the rate of decomposition of the naphthalene is taking place, showing that certain types of organisms are either capable of using naphthalene as a source of energy or are stimulated to greater activity by its presence. All the evidence indicates that the loss of naphthalene from the soil is mainly due to decomposition by bacteria.

α-Chlornaphthalene persists for a longer time in soil than naphthalene, and is decomposed at a slower rate, but it is more toxic to plants. An admixture of naphthalene appears to induce a more rapid disappearance of the toxicity of chlornaphthalene. Methods of estimating naphthalene are described.

PARKER (T.). **On the Control of Red Spider by Means of Naphthalene vaporised over a special Lamp.**—*Ann. Appl. Biol.*, xv, no. 1, pp. 81–89, 1 fig., 3 refs. London, February 1928.

Investigations on the use of naphthalene vaporised in lamps for fumigation against *Tetranychus telarius*, L., have been made in England during the past three years, and much of the information has already been noticed [*R.A.E.*, A, xiii, 589]. Trial fumigations were carried out on carnations, which are particularly susceptible to attack. Twelve fumigations were made with dosages varying from 3·9 to 13 oz. per 1,000 cu. ft. The temperatures varied from a maximum of 70–95° F. to a minimum of 60–70° F., and the relative humidity ranged between 80 and 95 per cent. In seven cases 100 per cent. mortality was recorded, while mortalities of 90–96 per cent. were obtained when concentrations as low as 4–5 oz. per 1,000 cu. ft. were used. Eight fumigations of tomatos with dosages ranging from 3·0 to 7·8 oz. per 1,000 cu. ft. all resulted in 100 per cent. mortality, and with the dosages below 6·7 oz. no scorching of the foliage was noticed five days after fumigation. The temperatures varied from a maximum of 74–99° F. to a minimum of 54–63° F., and the relative humidity from 84 to 95 per cent. Tomatos and vines are more liable to be damaged than carnations. When fumigating vines, it has been found advantageous to spread a sheet of hessian horizontally two or three feet above the lamp, thus preventing a dense concentration of naphthalene immediately above it. The combined cost of paraffin for the lamps and naphthalene for fumigation is approximately 1·4*d.* per 1,000 cu. ft.

ROBERTS (A. W. R.). **On the Life-history of "Wireworms" of the Genus** *Agriotes* **Esch. Part iv.**—*Ann. Appl. Biol.*, xv, no. 1, pp. 90–94, 3 figs., 8 refs. London, February 1928.

In this paper, which is one of a series [*R.A.E.*, viii, 137; x, 78; xi, 72], the characters distinguishing the larvae of *Agriotes obscurus*, L., *A. lineatus*, L., and *A. sputator*, L., are discussed.

JARY (S. G.). **Tar-oil Wash Trials in the West Midlands, 1926-27.**—*J. Minist. Agric.*, xxxiv, no. 12, pp. 1107–1113. London, March 1928.

During the winter of 1926–27 further trials of tar distillate washes were made [*R.A.E.*, A, xiv, 644]. Two brands not previously tested (Tarolite and Battle's Wash) were used, Mortegg being the standard with which they were compared. Two di-nitro-cresol washes were also tested, one consisting of di-nitro-cresol and a solvent, and the other of sodium di-nitro-cresylate and soft soap. The tar distillate washes were used at a concentration of 10 per cent. on apples and 6 per cent. on plums and damsons, while the di-nitro-cresol washes were in all cases diluted to a concentration equivalent to 0·2 per cent. of di-nitro-cresol. On apples *A*[*phis*] *pomi*, DeG., *A*[*nuraphis*] *roseus*, Baker, and *Psylla* [*mali*, Schmid.] were scarce, and the differentiation between the washes was not well marked, but it would seem that the tar distillates cleared the trees of these insects, while the di-nitro-cresol washes did not give complete control Under laboratory conditions it was found that the latter resulted in almost 100 per cent. mortality of winter moth eggs, but in the field all the washes were far less satisfactory. There may be a number of factors that account for the discrepancy. The caterpillars found on the trees may have been carried there by the wind after hatching elsewhere, or the moths may conceal some of their eggs in crevices and under loose bark, where they would escape contact with a wash applied under field conditions. Finally, it is by no means certain that all the eggs of the winter moths are laid by the time the washes are applied. The March moth [*Anisopteryx aescularia*, Schiff.] probably escapes in any case, and the ordinary winter moth (*Cheimatobia brumata*, L.) apparently ascends the trees over a long period so that it is possible that caterpillars that appear to have survived spraying really emerge from eggs laid after spraying is completed. None of the tar distillate washes can be relied on regularly to prevent infestation by caterpillars. The differences in effectiveness were small, and none can be said to be superior to the others. The best sprayed trees always had about half the number of caterpillars that were found on the control trees. Di-nitro-cresol was slightly less effective than the tar distillates, but somewhat superior to its sodium salt ; except in one orchard, neither of these washes gave more than a very slight control. The results of these trials also appear to confirm the conclusions of observers in other parts of the country that tar distillate washes cannot be relied on to control the Capsid bug [*Plesiocoris rugicollis*, Fall.]. In one orchard there was little difference between sprayed and unsprayed trees except where Mortegg had been used, but examination of the control trees showed an extremely uneven distribution of the Capsid, the figures varying from 0 to 75 per cent., and although in the second orchard the sprayed trees were less infested than the unsprayed trees, the control was probably only an apparent one, due again to the very uneven distribution of the insect.

On plums and damsons all the washes seemed to give satisfactory control of the leaf-curling plum aphis [*Anuraphis helichrysi*, Kalt.]. They were rather less effective against the winter moths on plums and damsons than on apples, as would be expected since spraying is usually carried out earlier. The covering power of the di-nitro-cresol washes was equal to that of any of the tar-distillate washes, and although they leave marked stains on the clothes and skin there is no residue that clogs the spraying machinery. The trees were not injured by any of the washes, and the strengths used may be regarded as safe when applied to plums and damsons before the end of January and to apples before the end of February.

GREEN (E. E.). **Observations on British Coccidae. xi. With Descriptions of new Species.**—*Ent. Mo. Mag.*, lxiv, pp. 20–31, 6 figs. London, 1928.

These observations include descriptions of three new species of British Coccids. Other records include *Lepidosaphes gloveri*, Pack., on imported oranges; and *Pinnaspis marchali*, Ckll., on *Hibiscus roseus*, *Rhizoecus decoratus*, Green, on the roots of *Cyperus*, and *Pseudococcus maritimus*, Ehrh., at the base of fruits of edible fig, all under glass.

BERNÈS (J.). **La lutte contre la fourmi de l'Argentine.**—*Vie agric. rur.*, xxxii, no. 11, pp. 174–175. Paris, 11th March 1928.

A brief popular account is given of the bionomics of *Iridomyrmex humilis*, Mayr, the damage it causes, and the usual methods employed for its control [*cf.* *R.A.E.*, A, ix, 251; xiv, 117].

HUBAULT (E.). **Un bacille parasite des chenilles de** *Dasychira pudibunda* **L. (Lepidopt. Lymantriidae).**—*C.R. Acad. Sci. Fr.*, clxxxvi, no. 17, pp. 1157–1159. Paris, 1928.

In 1926 and 1927 the beech forests of eastern France were invaded by *Dasychira pudibunda*, L. In September–October 1927, 10–12 per cent. of the larvae were found to be infected by a bacillus, which the author succeeded in isolating. Experimentally, it proved to be highly pathogenic to the larvae of *D. pudibunda* and to other insects of various orders when inoculated, but infection *per os* was difficult to accomplish.

MARIÉ (P.). **La défense contre les ennemis de la culture.**—*Rev. des Agriculteurs de France*, lx, no. 2, pp. 35–37. Paris, February 1928.

A brief account is given of the organisations existing in France for the protection of crops. These include the Institute of Agronomical Research, the Stations of Agricultural Entomology and Pathology, the Plant Protection and Phytopathological Inspection Services, the Agricultural Administration Offices, and the Departmental Syndicates for combating Crop Pests. The law of 3rd June 1927, which compels co-operation in carrying out the treatments prescribed, is quoted verbatim.

CHAPPAZ (G.). **La lutte contre la cochylis en Champagne en 1927.**—*Prog. agric. vitic.*, lxxxix, no. 10, pp. 229–232. Montpellier, 4th March 1928.

Measures adopted against *Clysia ambiguella*, Hb., in Champagne, which consisted of two applications of lead arsenate, used with the Bordeaux mixture employed against mildew, for the first generation, and two of nicotine sulphate for the second, have been successful in reducing the numbers of moths and increasing the weight of the crop in 1927. The first spray was also effective against other pests [*Sparganothis pilleriana*, Schiff., and *Byctiscus betulae*, L.].

The moths of the first generation of *C. ambiguella* were more numerous in 1927 than in the previous year, the flight lasting 15 days as compared with 10 in 1926, but owing to the effectiveness of the spray, the flight of the second generation was much smaller than that of the first, and also than that of the second generation of 1926. The flight of moths and the results of the treatment were established by means of bait or light traps.

de Hoogh (J.). **Insectenbestrijding uit vliegtuigen.** [Work against Insects from Aeroplanes.]—*Versl. Plantenziektenk. Dienst*, no. 49, 56 pp., 8 pls., 54 refs. Wageningen, November 1927.

A survey is given of the development in America and Europe of the use of aeroplanes for applying dust insecticides, and experiments in Pomerania in June 1927 against the nun moth [*Lymantria monacha*] are described. The conclusions reached are that results to date are encouraging, and that if forests in Holland are menaced by insect pests, an association of the owners, preferably with government assistance, could attempt control by this means. The use of aeroplanes might be of considerable value in the Dutch colonies.

van Poeteren (N.). **Verslag over de Werkzaamheden van den Plantenziektenkundigen Dienst in het Jaar 1926.** [Report on the Work of the Phytopathological Service in 1926.]—*Versl. Plantenziektenk. Dienst*, no. 51, 100 pp., 6 pls. Wageningen, January 1928.

Many of the pests in Holland recorded here were noticed in the previous report [*R.A.E.*, A, xv, 107]. Others include *Hylemyia coarctata*, Fall., on wheat; *Trachea* (*Hadena*) *secalis*, L., on rye; *Psylliodes chrysocephala*, L., on rape; and a root Aphid, *Pemphigus bursarius*, L. (*lactucarius*, Pass.), on caraway plants. *Dasychira pudibunda*, L., defoliated beech. A black ant, *Lasius fuliginosus*, Latr., destroyed the reproductive organs of pear and gooseberry even prior to the opening of the buds. The grasshopper, *Tachycines asynamorus*, Adel., injured cactus and other greenhouse plants; fumigation with calcium cyanide is suggested against it. *Phytomyza rufipes*, Mg., infested cauliflowers, and caterpillars, believed to be those of *Olethreutes urticana*, Hb., attacked cranberries. *Abraxas grossulariata*, L., and a sawfly, *Cimbex lutea*, L., injured osier willows. The breeding of *Aphelinus mali*, Hald., for use against the woolly apple aphis [*Eriosoma lanigerum*, Hausm.] has been continued, and some ninety batches were distributed. Though the parasite has become established in some localities, the general result was somewhat disappointing.

Schellenberg (H.). **Zur Bekämpfung der Kräuselkrankheit der Reben.** [On Combating the Crinkle Disease of Grape-vines.]—*Schweiz. Z. Obst.- u. Weinb.*, xxxvii, no. 5, pp. 83–85. Wädenswil, 3rd March 1928.

Infestation of grape-vines by the mite, *Eriophyes* (*Phyllocoptes*) *vitis*, Nal., occurs in many areas near the Lake of Zürich. Stunted growth due to a shortening of the internodes and the curling of the leaves lead to a decrease of the crop. The remedy adopted is painting with alkaline polysulphides such as lime-sulphur. The application should be made before the buds swell and the mites have entered them.

Die Behandlung der Obstbäume während der Winterruhe. [The Winter Treatment of Fruit Trees in Switzerland.]—*Schweiz. Z. Obst.- u. Weinb.*, xxxvii, no. 6, pp. 101–103. Wädenswil, 17th March 1928.

The best time for spraying fruit trees in winter is just before the buds swell. The solutions recommended include fruit-tree carbolineum, at 5 per cent. strength for stone-fruit and 8–10 per cent. for pip-fruit ; lime-sulphur solution of 25 per cent. strength with the addition of 1 per cent. iron vitriol (hydrous ferrous sulphate) ; or a mixture of fruit-tree carbolineum, 2 per cent., and caustic soda, 4 per cent. These sprays not only clear off mosses, lichens, etc., but also destroy various insect pests.

HENDEL (F.). **Ueber die minierenden europäischen** *Scaptomyza*-**Arten und ihre Biologie (Diptera).** [The Mining European Species of *Scaptomyza* and their Biology.]—*Zool. Anz.*, lxxvi, no. 11–12, pp. 289–302, 12 figs., 11 refs. Leipzig, 1st May 1928.

Scaptomyzella, gen. n., is erected for *Scaptomyza flava*, Fall., and *S. incana*, Meig. These flies attack a large variety of plants in central Europe, including spinach, sea-kale, cabbage, turnip, rape and peas. The eggs are laid in the parenchyma of the underside of the leaves, and the larvae make their way to the upper side and mine in it. Pupation normally takes place on the ground, but may occur in the leaves. The author observed two generations, one in May and June, the other in August.

Amtliche Pflanzenschutzbestimmungen. [Official Regulations on Plant Protection.]—*NachrBl. deuts. PflSchDienst.*, Beilage no. 12, pp. 213–238. Berlin, 1st March 1928.

This issue notices among others the German regulations for the inspection of imported fruits against the San José scale [*Aspidiotus perniciosus*].

RETTICH (—). **Das Auftreten der Kiefernbuschhornblattwespe** (*Lophyrus pini*) **in Baden 1927.** [The Occurrence of the Pine Sawfly, *Diprion pini*, in Baden in 1927.]—*Anz. Schädlingsk.*, iv, no. 2, pp. 15–17, 2 figs. Berlin, 15th February 1928.

An outbreak of the second generation of *Diprion* (*Lophyrus*) *pini* occurred in the pine forests on the Rhine in Baden in the late summer and autumn of 1927, the severity of the infestation being chiefly due to the favourable weather in May and June when the first generation larvae were feeding, and to the heat in July and August when oviposition took place. Development was not uniform, differences of two or three weeks being noticed under equal conditions. Defoliation was more frequent in pines in unmixed stands. In addition to *Pinus sylvestris*, other pines are attacked, chiefly *P. banksiana*, while in the absence of pines, spruce [*Picea*] and fir [*Abies*] are infested. The larvae also skeletonise deciduous trees, chiefly oak, and even attack heather, etc.

Owing to the sudden nature of the outbreak, none of the usual measures, except crushing the larvae, could be adopted. Excellent results were, however, obtained in experiments on a large scale with a proprietary arsenical dust applied with a power duster or from an aeroplane. Both methods are very costly and require favourable weather. No injury to bees, birds or game was noticed. Examinations of the hibernating larvae in their cocoons indicate that fungus infections and birds are active, and the protection of the latter should be rigorously enforced. The weakened trees are menaced by an increase of secondary Coleopterous pests, such as [*Myelophilus*] *piniperda*.

Ferrière (C.) & Voukassovitch (P.). **Sur les parasites des Aphides et leurs hyperparasites.**—*Bull. Soc. ent. Fr.*, 1928, no. 2, pp. 26–29. Paris, 1928.

This study was carried out in Serbia, near Belgrade, in 1925 and 1926; none of the parasites has previously been recorded from Serbia, and many of them are rare and little-known species. *Ephedrus lacertosus*, Hal., which is widespread and polyphagous, was bred from *Macrosiphum* (*Macrosiphoniella*) *absinthi*, L., in the first fortnight of July and from an undetermined Aphid in July–August. *Praon volucre*, Hal., was found very commonly throughout the summer and early autumn as a parasite of *M.* (*Megalosiphum*) *picridis*, F., *M.* (*M.*) *sonchi*, L., *Anuraphis* (*Brachycaudus*) *amygdali*, Buckt., *Rhopalosiphum lactucae*, Kalt., and *Brevicoryne* (*Aphis*) *brassicae*, L. *Aphidius medicaginis*, Marsh., which was identified a little doubtfully but shows no essential difference from Marshall's species, hitherto found only in France, and resembles also *A. ervi*, Hal., was frequently found in May parasitising undetermined Aphids on *Chenopodium*, and was itself almost completely destroyed by hyperparasites, especially *Aphidencyrtus aphidivorus*, Mayr. *Aphidius lonicerae*, Marsh., which resembles *A. rosae*, Hal., but was seldom seen, was bred from *M. sonchi* in July–August. *A. ervi*, Hal., was bred in June and July from *M. picridis*, *M. pisi*, Kalt., and in another district in Serbia, from *M. cyparissiae*, Koch. It was much infested by hyperparasites, as was *A. sonchi*, Marsh., a rare species, apparently only recorded previously from England, which was found in fair numbers in June as a parasite of *M. cyparissiae*. The other species dealt with are *A. cardui*, Marsh., polyphagous and obtained in numbers from *M. cyparissiae*; *A. brassicae*, Marsh., which, as in other countries, was obtained from *Brevicoryne brassicae*, which it seems particularly to attack; *Lysiphlebus dissolutus*, Hal., bred in numbers from Aphids on *Carduus* and *Chenopodium* but much attacked by hyperparasites; *Trioxys aceris*, Hal., of which only two individuals, one male and one female, were taken, from *Aphis ? ballotae*, Pass., on *Ballota foetida*; and another species of *Trioxys*, taken from *Aphis pomi*, DeG. (*mali*, F.) at the end of May. The effect of these parasites was, on the whole, slight at the beginning of summer and increased later; dense Aphid colonies were heavily parasitised, and sometimes every individual in a colony was attacked.

These parasites were themselves attacked by several Chalcids and a Cynipid, the activities of these being almost negligible at the beginning of summer, but reaching from 58 to 95 per cent. in July–August. The species include *Asaphes vulgaris*, Wlk., *Pachycrepis clavata*, Wlk., *Lygocerus testaceimanus*, Kieff., *Pachyneuron aphidis*, Bch., *Aphidencyrtus aphidivorus*, and *Allotria* (*Charips*) *victrix*, Westw., All of these, except *P. clavata*, which seems to be exclusive to *Ephedrus lacertosus*, attacked several of the primary parasites mentioned. Some of them may be tertiary parasites, especially the smaller ones, such as *Pachyneuron* or *Aphidencyrtus*. The latter, according to Silvestri, may be either a secondary parasite in an *Aphidius* or a tertiary parasite in an *Allotria*, which is itself a parasite of *Aphidius*. Cases of tertiary parasitism may occur even in the large species and would explain the great variarions observed as in the case of *Asaphes vulgaris*. The relations between host, parasites and hyperparasites are very complex, and it is difficult to follow their reciprocal action.

GRASSÉ (P. P.). **Sur quelques insectes de la vigne. Ephippigères et lamellicornes.**—*Prog. agric. vitic.*, lxxxix, nos. 10 & 11, pp. 232–236 & 262–265, 1 pl. Montpellier, 4th & 11th March 1928.

The extension of vine-growing in the south of France has led to the invasion of vineyards by many insects that are largely polyphagous and probably lived in many instances on the weeds on uncultivated ground in the vicinity. Among such pests are Tettigoniids of the genus *Ephippiger*, of which ten species occur in France, four of them attacking vines. *E. ephippiger*, Fieb., is the commonest and occurs throughout France, though it is more numerous in the south than the north ; it is omnivorous, though it prefers vegetation, its depredations being similar to those of the much more serious pest, *E. bitterensis*, Marq., which it closely resembles. The latter apparently occurs throughout the whole Mediterranean coast, but does not seem to be known outside France ; it is not found exclusively on vines, but occurs sometimes in orchards and is said to be attracted to cereal crops. The eggs hatch in April in the vineyards about Montpellier, and the insects become adult by the end of June. The eggs are laid singly in the ground in August and September, one female depositing from 60 to 80. This species is omnivorous and attacks shoots and young leaves, but prefers the green or ripe grapes. In captivity it is a cannibal, but it is not known whether decaying meat is attractive and whether bait traps of sheeps' heads would be of any value. Both young and adults injure the vines, the latter more seriously. Sprays of lead of calcium arsenate are very successful against the immature forms. Vines treated with sprays containing nicotine and copper sulphate are to some extent protected against the adults, but if necessary, a poison mash is spread between the vine rows and on the edge of the vineyard. This should be made of 5 to 8 lb. arsenic acid with 1 gal. molasses diluted in 2 gals. water, the whole being thoroughly mixed with bran. Hand collection of the adults is of value, but the vines should be first beaten to shake off the insects that hide under the foliage. Turkeys will assist in clearing off the insects, but soon tire of them. *E. terrestris*, Yers., is abundant in the Alpes-Maritimes and Var on vines and fruit trees. *E. provincialis*, Yers., occurs south of the Maures on vines and other cultivated plants. Another Tettigoniid, *Barbitistes berenguieri*, Mayet, also does serious damage to vines and fruit-trees and should be treated in the same way as *Ephippiger*.

Several Lamellicorns are common in France, two of which are here dealt with. The adults of the Dynastid, *Pentodon punctatus*, Vill., emerge from the ground towards the end of April and are thought not to feed. After pairing, the female begins to oviposit, laying generally about 40 eggs in small groups in the ground about 4 ins. deep. These hatch in June. The larvae have been said to feed on decayed roots, but this requires verification. It is probable that they feed actively until autumn and, when the cold weather arrives, hibernate at some depth in the soil, ascending again in spring and feeding on roots, repeating the descent for the winter and re-ascending in the following spring. In June or July the larva constructs a pupal cell in which it transforms to the adult by the end of August.

The adult does not emerge until the following spring, or may appear for a short time about September and re-enter the ground for hibernation. The larvae injure the vine in two ways, by feeding on the roots and by attacking the point of juncture of the grafts in nurseries and plantations, the latter being particularly serious. The collection of adults is fairly easy, as the insects are visible by day and move heavily, but a far better remedy is the disinfection of the soil, and this is absolutely essential in nurseries. Injections of carbon bisulphide or carbon tetrachloride, although expensive, are worth while owing to their sure results. In plantations, carbon bisulphide should be injected at about 10 inches distance from the vine stock, in dry weather. If larvae are known to be present, the soil might be disinfected even before planting the young vines. Solutions of sodium or potassium sulphocarbonate (¼ to ½ lb. to 10 or 15 gals. water) also destroy the larvae, but do not give such good results.

The Rutelid, *Anomala vitis*, F., lives in the sandy soil of olive-growing districts and has a similar life-history, but the life-cycle requires only two years. The adults appear chiefly in June and devour both leaves and shoots of the vine ; they multiply in enormous numbers, flying in clouds about the vines at night. If the plants are attacked before or during flowering, arsenical sprays are an excellent remedy ; after flowering, sprays of nicotine and copper sulphate can be used, but with less success. Hand collection of the adults should also be practised. The damage done is never so great as that caused by *P. punctatus*. It is possible that other species of *Anomala*, such as *A. aenea*, DeG., and *A. ausonia*, Er., have been confused with *A. vitis* and have caused damage to vines.

RAVAZ (L.). **La lutte contre l'eudémis et la cochylis.**—*Prog. agric. vitic.*, lxxxix, no. 11, pp. 253–258. Montpellier, 11th March 1928.

Clysia ambiguella, Hb., is losing ground in France and is now rare, sometimes impossible to find, in most of the vineyards of the south ; it seems, however, to be well established for the moment in the sandy vineyards close to the sea, where the damage it causes is sometimes negligible and sometimes disastrous. In the rainy districts of northern France it is still more abundant than *Polychrosis botrana*, Schiff. The latter, which first appeared in the southern provinces (Provence, Gironde, Languedoc, etc.) is spreading further and further north and replacing *C ambiguella*. In Burgundy, both occur in about equal numbers and sometimes infest the same vine.

The measures practised against these moths are reviewed and their use in 1927 is discussed [*R.A.E.*, xvi, 34].

MORRIS (H. M.). **Entomological Notes.**—*Cyprus Agric. J.*, xxiii, pt. 1, pp. 32–33. Nicosia, January 1928.

This list of insects recorded in Cyprus, which is the fifth of a series [*cf. R.A.E.*, A, xv, 655] deals with 36 species, none of which are of more than minor importance, six being possibly or definitely beneficial. No food-plants are given, except in respect of the following Coccids: *Ceroplastes rusci*, L., on figs, *Crataegus*, oleander, etc., *Coccus hesperidum*, L., on *Citrus*, *Aspidiotus britannicus*, Newst., on leaves of carob [*Ceratonia siliqua*], and *Pollinia pollini*, Costa, on olive. The two definitely beneficial insects are *Sigalphus thoracicus*, Curt., a parasite of *Bruchus dentipes*, Bdi., which damages broad bean seeds, and *Apanteles glomeratus*, L., a parasite of *Pieris brassicae*, L.

LINDSAY (S.). **On the Occurrence in New Zealand of** *Coleophora fabriciella*, **Villiers.**—*N.Z. J. Sci. Tech.*, ix, no. 4, pp. 248–249, 1 fig. Wellington, November 1927.

Adults of *Coleophora fabriciella*, Villers, have been found in two localities in New Zealand where clover occurs, and it is thought that the moth has only recently been introduced. Meyrick quotes the Leguminosae as the food-plants of *C. fabriciella*, and it is possible that it may become a pest of clovers. A short description of the moth is given.

FROGGATT (J. L.). **Notes on Banana Insect Pests.**—*Queensland Agric. J.*, xxix, pt. 1, pp. 15–35, 9 pls., 6 refs. Brisbane, 1st January 1928.

The greater part of the information concerning the more important of the insects attacking bananas in Queensland discussed in this paper has already been noticed. The only insect infesting the bulb of the banana plant in Queensland is *Cosmopolites sordidus*, Germ. (banana weevil borer). Insects damaging the fruit include: *Scirtothrips* (*Anaphothrips*) *signipennis*, Bagn. (banana thrips); the fruit-flies *Dacus ferrugineus*, F. (*Chaetodacus tryoni*, Frogg.), *D.* (*C.*) *musae*, Tryon, and *Rioxa musae*, Frogg.; the Coreids, *Pendulinus lutescens*, Dist., and *P. fuscescens*, Dist., and the Pentatomid *Calliphara imperialis*, F. (fruit spotting bugs); the Noctuids, *Tiracola plagiata*, Wlk., *Aginna circumscripta*, Wlk., *Phytometra* (*Plusia*) *chalcites*, Esp., and *Simplicia robustialis*, Gn.; and the Pyralids, *Nacoleia* (*Notarcha*) *octosema*, Meyr., *Tirathaba rufivena*, Wlk., and *Dichocrocis* (*Conogethes*) *punctiferalis*, Gn. Two species of Tettigoniids feed on the skin of the green fruit, and where the fruit is allowed to turn yellow before being cut, it suffers considerably from the attack of fruit-sucking moths, *Othreis fullonica*, L., and *O.* (*Argadesa*) *materna*, L., being two of the species concerned.

The foliage is attacked by the following: *Cyrtacanthacris* sp., *Prodenia litura*, F., the Eumolpid, *Rhyparida discopunctulata*, Blkb., the weevil, *Rhabdocnemis obscura*, Boisd., the Tineid, *Opogona glyciphaga*, Meyr., the Aphid, *Pentalonia nigronervosa*, Coq., which is the vector of bunchy-top disease, and the Coccids, *Aspidiotus cydoniae*, Comst., and *Saissetia nigra*, Nietn. The Galerucid, *Monolepta rosea*, Blkb., sometimes destroys the petals on the flowers.

Notes are given on the distribution of these insects and the type of injury they cause.

JARVIS (E.). [**Annual Report of the Entomologist, Northern Division, 1926–27.**]

MUNGOMERY (R. W.) [**Annual Report of the Assistant Entomologist Southern Division, 1926–27.**]—*27th Rep. Bur. Sugar Expt. Stas., Queensland*, pp. 18–27. Brisbane, 1927.

The greater part of the information contained in these reports has already been noticed from the monthly reports of the Division of Entomology. The following notes were made in breeding various insects of economic importance in the Northern Division: The pupal stage of *Pseudoholophylla furfuracea*, Burm., lasted 3—4 weeks, and the beetles remained three weeks or longer in the pupal cells before emerging. The pupal stage of *Lepidiota trichosterna*, Lea, occupied about four weeks, the beetles remaining in the pupal cells for about three weeks longer. The pupal stage of *Pentodon australis*, Blkb., lasted 9–10 days. The pupal stage of *Chusaris rhodias*, Turn., lasted 9 days. The eggs of *Locusta migratoria* ph. *danica*, L. (*australis*, Sauss.) laid during May took 14–18 days to hatch, while those deposited in July took 36 days.

McCarthy (T.). **White Curl Grubs of the Wheat Root Beetle.**—*Agric Gaz. N.S.W.*, xxxix, pt. 1, p. 54. Sydney, 1st January 1928.

The Melolonthid, *Anodontonyx tetricus*, Blkb., has been present during the past two seasons in wheat fields in one locality in New South Wales. Observations made during the early part of November showed that the grubs were about to pupate. Ploughing was recommended, and apparently a number of pupae were killed. The crops in this district were largely a failure on account of the drought, and the damage caused by the beetle was correspondingly greater owing to the inability of the young plants to recover from attack after their growth had been retarded. That vigorous growth is an important factor in limiting the damage by these larvae was shown by the fact that, in another district, 65 acres of badly infested wheat practically outgrew the attack, the final loss being estimated at about 7 per cent.

Seddon (H. R.). **Poison Bait for Grasshoppers.**—*Sci. Bull. Dept. Agric. N.S.W.*, no. 29, pp. 51–53; also *Agric. Gaz. N.S.W.*, xxxix, pt. 1, pp. 64–66. Sydney, July 1927 & 1st January 1928.

Experiments undertaken to test the danger of distributing poison baits on pastures for the control of grasshoppers are described. Doses of 20 grains of both sodium arsenite and of Paris green were fatal to sheep, but in neither case did a dose of 6·6 grains produce any ill effects. Under different circumstances there appears to be a great variation in the toxicity of sodium arsenite for sheep, and in hot weather in South Africa a dose of 3 grains proved toxic to 40 per cent. of the sheep. The experiments show that when the bait is applied to bare ground in the form of pellets the size of a walnut, sheep may eat it; when it is broadcast on bare ground, sheep may take Paris green bait in sufficient quantity to cause symptoms of arsenical poisoning, possibly even death; when it is broadcasted on pasture, even at the rate of 100 lb. an acre, sheep graze without obtaining a toxic dose. It is therefore recommended that the bait be well scattered; that it should not be applied to bare ground; and that stock should be kept off baited ground for one or two days, by which time, in fine weather, the bait will have dried to "chaff." Assuming that the finer the form of the bait the less likely it is to be picked up, it would seem that bran alone, rather than pollard or a mixture of bran and pollard, should be used, since it is then almost impossible for the bait to stick together in the form of pellets. It would also appear that the green colour of Paris green is attractive, at least on bare ground, and if sodium arsenite is equally effective, it is suggested that the use of

Paris green be discontinued. It is pointed out that these precautions are not adequate under all conditions and that where possible bait should be spread where it is not accessible to stock.

Brereton (W. LeG.). **Fumigation Tents and Sheets.**—*Agric. Gaz. N.S.W.*, xxxix, pt.1, pp. 67–75, 7 figs. Sydney, 1st January 1928.

Instructions are given for cutting out and making various types of tents and sheets used for fumigating *Citrus*.

Newman (L. J.). **Grain Weevils.**—*J. Dept. Agric. W. Aust.*, iv, no. 4, pp. 538–545, 1 pl. Perth, December 1927.

The greater part of the damage caused to stored grain in Western Australia is due to *Calandra oryzae*, L. (rice weevil) and to a less extent to *C. granaria*, L. (granary weevil). *C. oryzae*, which is regarded as a native of India, is described, and the points on which it differs from *C. granaria*, which is of European origin, are indicated. The bionomics of both weevils are very similar. The egg stage lasts 3–5 days, the larval period 20–30, and the pupal stage 3–5. The adults may live for 12 months and deposit many hundreds of eggs. As the life-cycle can be completed in 30 days in summer, 7 or 8 generations might occur annually under Western Australian conditions. Both adults and larvae feed on the grain. Tests have shown that wheat harvested under local conditions is free from insect life, and that infestation is due to contact with weevils after harvesting. Sources of infestation are old bags, stores or stacking sites, or the introduction of bags of infested wheat.

It has been demonstrated that the weevils, which increase in wheat according to the percentage of moisture in the grain, are dormant with a moisture content of less than 10 per cent. A temperature of 80° F. without moisture proves fatal. Western Australian wheat contains on an average 7 to 8 per cent. of moisture when harvested, but the point that favours the multiplication of the weevil is quickly reached by the absorption of moisture from the air or soil, or through exposure to rain. Infestation may be prevented by clean and dry storage, and the use of new bags and firmly built stacking floors without crevices. Bags of wheat must not be left standing on the bare ground or uncovered, and newly harvested grain should be kept separate from old grain of the previous season.

Various measures are described for the treatment of old stacking sites where these have to be used again. Old sleepers or dunnage may be treated with 50 per cent. bitumen mixed with 50 per cent. crude oil. The bitumen is broken up and brought to a temperature of 300° F. in the dipping tank, the oil being added when all lumps are dissolved and the temperature does not exceed 220° F. The mixture is then brought to a temperature of 350° F. and maintained at this heat while the sleepers or dunnage are passed through the tank. The temperature must not be raised beyond 425° F., as this is the explosive point of the mixture. If the residue is not poured off after treatment, there is danger of burning the bottom of the tank when reheating. In order to compensate for the evaporation of volatile oils, 2 per cent. of crude oil must be added to the quantity remaining in the tank each day. Implements and old bags should be dipped in boiling water, with the addition of a little copper sulphate in the case of the bags.

Seed grain may be successfully treated with copper carbonate [*R.A.E.*, A, xiii, 499], but there is danger of poisoning if it is used for wheat intended for food. Stored grain may be fumigated with carbon bisulphide at the rate of 1½ to 2 lb. to 1,000 cu. ft. of space or 100 bushels of grain, poured into shallow dishes placed at the top of the stack and left to evaporate. The building should be kept under gas for 48 hours. Good results have also been secured with Cyanogas calcium cyanide " A " dust mixed with the wheat or applied by means of a dust bellows forced through the interspacing of the bags at the rate of 25 lb. dust to 1,000 bushels of wheat. The period of exposure is 72 hours, and the dust can be applied with success at as low a temperature as 40° F. It does not act as a preventive, but destroys all living insects present, and has no deleterious effect on the grain as food or from the point of view of milling, baking or germination.

LEA (A. M.). **The Cotton Bollworm in South Australia.**—*J. Dept. Agric. S. Aust.*, xxxi, no. 6, pp. 608–615, 17 figs., 1 ref. Adelaide, January 1928.

This account of the bionomics and control of *Heliothis obsoleta*, F., is largely taken from the literature in other parts of Australia and the United States. In South Australia *H. obsoleta* has a great variety of food-plants, but is chiefly a pest of lucerne, of which it may destroy as much as 80 per cent. of the leaves, with the result that in bad attacks the milk yield of cows is greatly reduced. Lucerne is also attacked by cutworms, particularly *Euxoa radians*, Gn., and of the other food-plants of *H. obsoleta*, maize is sometimes seriously infested by *Agrotis spina*, Gn. (bugong moth), cotton, which has only been grown experimentally, by *Earias fabia*, Cram., potato by *Phytometra* (*Plusia*) *argentifera*, Gn., which occurs in large numbers and sometimes completely destroys a crop, tomato by *Persectania* (*Mamestra*) *ewingi*, Westw. (*composita*, Gn.), and oats, wheat and barley by *P. ewingi*, and *Cirphis* (*Leucania*) *unipuncta*, Haw. In South Australia there are probably only three full generations of *H. obsoleta* a year, and the serious damage is done by the earlier ones, the later ones being checked by natural enemies and cannibalism. Notes are given on parasites found in other parts of Australia and in America, and it is thought that some of the latter might be introduced.

BALLARD (E.). **Summary by the Cotton Entomologist attached by the Corporation to the Government of Australia of his Work in Queensland, 1924-1927.**—*Emp. Cott. Grg. Corp. Reps. Expt. Stas., 1926–27*, pp. 35–48, 2 figs. London, 1928.

The pink bollworm [*Platyedra scutigera*, Holdaway] [*cf. R.A.E.*, A, xiv, 459 ; xv, 549] is established in all cotton-growing areas north of Maryborough, but except where ratooning has been the practice, it has not done any serious damage inland, though it is much more prevalent on the coast. Its control in areas where it occurs will depend on ensuring a close season and thorough cleaning of the fields. Provided that due precautions are taken in seed disinfection and quarantine inspection of imported seed and seed cotton, no great loss need be anticipated from it. Standover and ratoon crops suffered so heavily, the area under cotton in one locality falling from 3,000 acres to less than 100, that very few farmers now grow cotton in this way. The most reliable means of ascertaining the distribution of this pest is the periodical inspection of the incoming cotton in the ginneries.

In any fairly favourable planting season, the control of *Heliothis obsoleta*, F., which is discussed at length [xv, 548] can be carried out successfully; experiments indicate that if dusts have to be used 10–15 lb. calcium arsenate to the acre are necessary. *Tectocoris lineola*, F., and *Dysdercus sidae*, Montr., cause severe injury to early planted cotton; the life-history and damage caused by the former, which can be successfully controlled by hand-picking, have been previously recorded [xiv, 223], and notes are given on the bionomics and control of the latter, a full account of which will be published shortly. Early planted cotton is also damaged by cutworms, but if the attack is noticed soon enough and poison baits used, no serious injury is caused. *Dichocrocis* (*Conogethes*) *punctiferalis*, Gn. (yellow peach moth) particularly attacks the last formed bolls of early planted cotton and also seriously infests late planted cotton. Its other food-plants are very numerous and include maize, which is more readily attacked than cotton. Where maize occurs, it only infests early ripening cotton when the bolls are too advanced for any appreciable damage to be done.

PARNELL (F. R.). **Report on the Work of the Cotton-breeding Station, Barberton, Transvaal, for the season 1926-27.**—*Emp. Cott. Grg. Corp. Reps. Expt. Stas., 1926–27*, pp. 49–65, 8 pls., 5 figs. London, 1928.

The experimental work on the selection of varieties of cotton resistant to the Jassid [*Empoasca facialis*, Jac.] has been continued [*R.A.E.*, A, xv, 195]; a weekly account was kept of the visible effect of the Jassid on six different varieties, and it was found that this could be detected long before any reddening of the leaves took place. A record was also kept of the number of Jassids to be found on the plants; in 1927 the numbers rose rapidly from late March, reaching their maximum on 25th April and then declining until the end of May, when they became negligible. As has been previously recorded, Cambodia cotton remained almost entirely immune; the newly imported American varieties, however, were very highly susceptible. In the case of the most heavily infested of these varieties, infestation was at first very high but then dropped, and then increased again; it is thought that this can be accounted for by the plants becoming so badly infested in the early stages that the Jassid ceased to breed on them, but on a resumption of growth, infestation took place once more. Experiments were also made with various fertilisers, but in all cases the treatment was ineffective. During the course of the experiments, however, it was noticed that when Aphids were present on the plants there were very few, if any, Jassids. In the work done on the connection between hairiness and Jassid-resistance, it was found that both the density and the length of the hairs are concerned; Cambodia, for example, has a low density but very long hairs and is highly resistant, two other very resistant types show high density and have long hairs, while two others, which are very susceptible, show a low density and hairs of moderate length. The most highly susceptible type of all has the lowest density; no type has yet been found with a high density and very short hairs.

Parsons (F. S.). **Report on the Work of the Cotton Experiment Station, Candover Estates, Magut, Natal, for the Season 1926-27.** —*Emp. Cott. Grg. Corp. Reps. Expt. Stas., 1926–27*, pp. 66–82, 1 chart, 2 refs. London, 1928.

In the section dealing with insect pests, mention is made of the continuation of the work on the control of *Syagrus rugifrons*, Baly (cotton seed beetle) ; an application of 5 lb. calcium arsenate to the acre at a cost of 4*s*. 5½*d*. destroys at least 90 per cent. of the beetles.

Observations indicate that strips of ratoon cotton are of value as traps for the spiny bollworm [*Earias*] and the Sudan bollworm, *Diparopsis castanea*, Hmps. It is advisable to have plants bearing fruit on the trapping sites in late August and early September when spring oviposition takes place ; for this purpose severely pruned plants may be used. In most years winter rainfall may be expected, and fruiting would take place in early September on pruned plants or on plants ratooned to 8 to 10 ins. in the early winter. It would therefore appear important to have other and later ratooned strips cut well back to provide food when these are stripped of their fruit ; no actual cutting down or severe cutting back is, however, desirable since the object is to retard the onset of fresh buds as little as possible. During the season 1926–27, the trap rows produced overlapping fruit, and a systematic stripping of the fruit was undertaken whenever the condition of the bollworm rendered it warrantable. There appear to be two main bollworm periods, the first from early spring to December and the second in March and April.

A malvaceous plant, *Cienfugosia hildebrandti*, has been observed in various localities, and larvae taken from it closely resemble those of *D. castanea* ; if the adult proves to be identical, this plant is probably an important source of primary infestation in new cotton areas. It may now be definitely stated that *Hibiscus calycinus* is a food-plant of *D. castanea*, but this plant is not common.

Dysdercus spp. were very prevalent in March, and the amount of stained cotton increased with successive pickings ; the majority of late bolls, set in May and June, probably did not open at all owing to internal boll disease, and the final small flushes of cotton are not considered worth picking. Seed cotton traps may be left in the lands as a means of control, and while clean bollworm traps will not encourage the stainer, it is suggested that seed cotton pits be left in the rows at intervals, and occasionally treated with a blow lamp, although similar traps did not seem of much value during the growing season.

Wood (R. C.). **Swaziland. Report on the Work of the Cotton Experiment Station, Bremersdorp, for the Season 1926-1927.**—*Emp. Cott. Grg. Corp. Reps. Expt. Stas., 1926–27*, pp. 83–104, 1 pl., 1 chart, 2 refs. London, 1928.

The Jassid, *Empoasca facialis*, Jac., was first noticed in this district on 18th January, but only began to appear in large numbers in the middle of February ; after 5th April the increase in numbers ceased. The effect of the Jassid on various strains of cotton is briefly discussed, very successful crops being obtained from some of the Jassid-resistant strains.

Further observations have been made on the life-history of *Diparopsis castanea*, Hmps. It is present in large numbers in January and

February, and this early attack is a heavy one ; it is, therefore, suggested that hand-picking would bring considerable relief to the later stages of the crop. In one locality all flared squares from the standing crop were picked off, it being found necessary to do this 2 or 3 times during the growth of the crop, and it is probable that large numbers of larvae were destroyed in this way ; this area produced the heaviest crops of the country, one grower picking over 1,000 lb. to the acre. The possibility of *Cienfugosia hildebrandti* being a wild food-plant of *D. castanea* is discussed [see preceding paper].

Internal boll rot, which is associated with the presence of *Dysdercus* (cotton stainers) and *Oxycarenus* (cotton seed bugs), caused a great deal of damage during the season, some plots suffering so badly that it was difficult to find a healthy boll. Adults of *Dysdercus* were first found on 22nd January ; pairing was observed at the end of February and the first immature larvae on 7th March. Large numbers were found till the end of March, but after this the increase does not appear to have been rapid. The majority of the stainers were to be found on the lower branches of the plants in the progeny rows, where owing to wide spacing the plants were large and straggling and the branches lay along the ground collecting fallen leaves and rubbish. It is reported that irritation is caused to the hands of pickers when *Oxycarenus* is present in large numbers, and it also imparts an unpleasant smell to the cotton ; this pest has also been found in the fruits of *C. hildebrandti* that had been eaten out by the bollworm.

Weevils, the majority of which were identified as ground weevils, but which also included a specimen of *Apion* sp. known as a pest of cotton in East Africa, have been reported as attacking cotton. In one locality the larvae of *Syagrus rugifrons*, Baly (cotton seed beetle) killed fairly large cotton plants in early March by ringing the tap root.

In some areas Meloid beetles almost entirely preclude the production of certain pulses, including *Phaseolus mungo* (mung bean), which grew well but was nearly exterminated by the beetles. Hand-picking is the only method of control that can be recommended at present.

PEAT (J. E.) **Cotton-Breeding Station, Gatooma, Southern Rhodesia. Report for the Season 1926-27.**—*Emp. Cott. Grg. Corp. Reps. Expt. Stas., 1926–27*, pp. 105–133, 8 pls., 4 figs. London, 1928.

The worst pest of cotton during the season was the Jassid [*Empoasca facialis*, Jac.] ; occasional insects were noticed in the middle of January when the cotton was being thinned and the effects of the attacks became noticeable in the trial plots by 21st February. During the next two weeks, a great increase in boll shedding took place, and the attack grew steadily worse throughout the remainder of the season. The Jassid-resistance of various strains of cotton is discussed and the symptoms are described, these being most apparent during the development of the bolls, so that an early maturing strain may appear to have less resistance at a given date than a later maturing one, although it may be seen from the ultimate yield that this is not the case. The yield of cotton for the season was very poor, only a few of the early maturing bolls developing and the large majority of the remainder being shed or opening immaturely or imperfectly.

In cage experiments, selected pairs of three strains of cotton were placed in cages and fumigated twice, at an interval of ten days, by sprinkling calcium cyanide dust on the soil underneath ; two days after the last application, 200 to 300 Jassid nymphs were introduced on one of each pair. Two of the strains showed increasing signs of attack, while the controls recovered to some extent, and Cambodia, a highly resistant strain, began to be affected after 10 days, although the controls and the neighbouring plants were free from symptoms. The nymphs placed on this strain showed signs of discomfort, but, if forced to, can evidently live and cause symptoms of attack on plants that are practically immune in the field. Other experiments support the view that the damage is caused by the injection of a toxic secretion by the Jassid rather than by the transmission of a disease organism. The hairiness of the plants was also estimated, and it was found that taking into consideration both their hair density and hair length, the order of hairiness is the order of resistance. Manurial treatments were found to have no apparent effect on the degree of Jassid attack.

Dysdercus, which is now recognised as likely always to be a serious pest of cotton in Southern Rhodesia, was successfully controlled by hand-picking on the trial plots. During the dry season, old cotton stalks and the grasses around the fields were burnt to destroy the overwintering stainers. The first adults were seen on the plants on 7th February, and by the end of the month they were numerous and continuing to increase. Traps, consisting of a few ounces of cotton-seed placed under a bushy and shady cotton plant and kept moist by watering every second or third day, when necessary, were put down on 1st March. About 80 traps were used over 8½ acres, the stainers being collected every morning and the traps renewed once in two weeks, until 20th April, when the bolls were opening freely and were found to be more attractive to the insects ; hand-picking of the plants was then undertaken. A table is given showing the numbers of stainers collected in the traps, the largest numbers being taken on dull days and after rainy nights. As a result of these measures, there was very little staining in mature cotton, but the numbers collected indicate that the possible infestation would have been very great. *Dysdercus* has been observed to feed during the winter on *Hibiscus* spp., *Thespesia garckeana* and the fallen fruit of *Andansonia digitata* (baobab).

Although 73 per cent. of the bolls were shed during the season, only 2·3 showed signs of bollworm attack, and this was due to the spiny bollworm [*Earias*] in almost all cases. The American bollworm [*Heliothis obsoleta*, F.] was in all probability eliminated by the long dry season and the late rains, which destroyed the first broods. There were two or three outbreaks of Aphids, the most severe occurring during the third week in January, and the second and third weeks of February ; in both cases however the pest was kept in check by natural enemies, including Syrphid larvae and Coccinellids, which, however, were less numerous on the very hairy strains of cotton, so that Aphid attacks on these lasted longer and were more severe. Ten per cent. of the plants in the experimental plots were killed by termites between 20th January and 18th March.

NYE (G. W.) & KILLICK (A. B.). **Uganda. Report on Cotton Experiments, Serere Station, Season 1926-27.**—*Emp. Cott. Grg. Corp. Reps. Expt. Stas., 1926–27*, pp. 177–188. London, 1928.

Jassids were probably the most serious agents in destroying the cotton crop in experimental plots and increased in numbers owing to the dry weather ; cotton bollworms and cotton stainers were not responsible for more damage than in previous years. June-sown plots suffered from the attack of *Syagrus* sp.

Lochrie (J. V.). **Nyasaland. Makwapala Cotton Station, Report for the Season 1926-27.**—*Emp. Cott. Grg. Corp. Reps. Expt. Stas., 1926–27.* pp. 190–216, 6 figs. London, 1928.

The chief pests of cotton during 1926–27 were *Diparopsis castanea,* Hmps., injury by which was, however, decidedly less severe than in the previous season ; *Dysdercus,* which caused most damage to the later pickings, when trapping with cotton seed was useless ; and Jassids [*Empoasca facialis,* Jac.]. The severity of attack by Jassids on fairly resistant strains depends largely on the condition of the plant and the quality of the soil. Tables are given showing the numbers of bollworms taken in weekly collections and of buds and bolls shed as a result of their attack. *Earias* sp. and *Heliothis* (*Chloridea*) *obsoleta,* F., were of little importance, but the latter occurred on maize and was very numerous on the flower heads of tobacco, the presence of which may serve to keep it away from cotton.

Lawrence (E.). **Nyasaland. Port Herald Cotton Station. Report for the Season 1926-27.**—*Emp. Cott. Grg. Corp. Reps. Expt. Stas., 1926–27,* pp. 216–230, 7 figs. London, 1928.

The most serious pest of cotton in this locality was *Dysdercus,* which was present in the fields from the second week in April until the middle of September, eggs being found under heaps of dry trash, but never on the cotton plants. The bugs were most active in dull wet weather and in the early morning ; they have been found breeding on an unidentified malvaceous tree, and on *Thespesia. Oxycarenus* was not noticed until picking time, when it was found in large numbers on the seed cotton. *Heliothis* (*Chloridea*) *obsoleta,* F., was present in small numbers in May and June, and *Earias* throughout the season, but *Diparopsis castanea,* Hmps., caused more damage than these two species.

King (C. B. R.). **Nyasaland. Report on Entomological Work on Cotton, Season 1926-1927.**—*Emp. Cott. Grg. Corp. Reps. Expt. Stas., 1926–27,* pp. 231–233. London, 1928.

Experiments have been continued in Nyasaland with light-traps for the moths of the red bollworm, *Diparopsis* [*castanea,* Hmps.]. Five acres of cotton were planted in a field that had been under maize in 1926, though cotton had been grown in the immediate vicinity, so that any insects attacking the crop would come from the outside. Hand-picking of the moths was practised from the first appearance of the squares, about the end of January, until the end of February when the cotton became too bushy to find them. At this time a light-trap was brought into use ; it consisted of an open acetylene flame over a shallow basin containing water and paraffin. It has previously been stated that light-traps do not catch the moths [*R.A.E.,* A, xiv, 589], but the trap in question was very successful, and comparatively few fresh eggs were found in the field, except in places remote from the light, where a very small second generation was found. The moths caught included both sexes, and all females examined contained mature eggs. Immigration only took place in a favourable wind, the moths coming into the field from the direction of the previous year's crop. After 29th April no moths were caught in the trap, and the numbers of the females considerably decreased, although males were still present. During the second week of the moon in each month practically no moths were caught, but it is possible that if stronger lights were used this period might be reduced. The traps appear to have little effect on *Heliothis* [*obsoleta*, F.] and *Earias*, only one of the former and two of the latter being caught. The yield of cotton was about three times the average for the past six years. The cost of the control measures practised is estimated at 4*s*. an acre and the increased profit at about £4.

Cotton-seed traps were put down in early February for cotton stainers [*Dysdercus*]; these consisted of a V-shaped pit the width of a hoe and 12 ins. deep dug at intervals of 50 yds. round the field, in which a handful of cotton-seed was placed. A large number of stainers were caught, and killed by shovelling the earth back into the pit and ramming it with a pole, a fresh pit being immediately dug alongside. The stainers like shade and are to be found on the shaded side of the pit or under the seed, and care should therefore be taken that the earth is thrown well away from the top so that the stainers will go into the pits for shelter. Although large numbers of the stainers were caught during the season, they multiplied rapidly as soon as the bolls began to open. Most of the early cotton was clean, but the percentage stained increased as the season advanced. As the nights became colder, however, the immature stainers sunned themselves in the early morning in exposed positions, and a local fish-poison tested as a contact insecticide appeared to be of value.

ANSON (R. R.). **Fiji. Report on the Work of the Cotton Experiment Station, Sigatoka, for the Season 1926-27.**—*Emp. Cott. Grg. Corp. Reps. Expt. Stas., 1926–27*, pp. 240–251, 1 pl., 1 chart. London, 1928.

Platyedra gossypiella, Saund. (pink bollworm) was present on all varieties of cotton in Fiji, but is not so prevalent as in other cotton-growing regions. *Apanteles* sp., the pupae of which have been found in the bolls, has been bred out several times and is considered to be a parasite of *P. gossypiella*; the pupa of the latter is parasitised by a Chalcid. It is thought that this and other pests could be greatly reduced in numbers if bolls that abort at the beginning of the season were collected and burnt. *Dysdercus insularis*, Stål, was very abundant towards the end of the season, in spite of hand-picking and collection. This pest has numerous wild food-plants and migrates to cotton as an adult, shortly after it has reached maturity, the best cultivated crops usually suffering most, since the earliest maturing cotton attracts all the stainers present in the locality. The eggs of *D. insularis* were found in the soil at a depth of 1–1½ ins. *Tectocoris lineola*, F. (harlequin bug) has been controlled by hand-picking; this insect has now been found to be the cause of a brown stain of the lint, which had previously been mistaken for a mineral oil stain. A Jassid that has been found in great numbers attacks cotton leaves in all stages, causing a small yellowish blotch, which later becomes reddish brown, on the lower surface. The discoloured areas dry up and contract so that the leaves curl. One or two strains of cotton appear to be immune. *Dacus* *passiflorae*, Coq., infests the bolls, causing them to develop a slimy brown earth-coloured rot; no external sign is, however, visible. This fruit-fly has apparently changed its habits, since it has been found pupating in sections of the boll instead of in the ground. It has a large number of food-plants in Fiji and would therefore be difficult to control. All the terminal branches of one variety of cotton were attacked by *Earias fabia*, Cram. (tip worm), the plants dying back and becoming straggly, while their development was retarded.

GOLDING (F. D.), LEAN (O. B.) & LAYCOCK (T.). **A Critical Comparison of the Factors inhibiting the Development of three Species of Cotton in Southern Nigeria.**—*6th Ann. Bull. Agric. Dept. Nigeria*, pp. 5–69, 4 charts, 16 refs. Lagos, 1927.

In the section of this paper dealing with insect incidence the results are given of index picking carried out from September 1925 to January 1926 showing the relative occurrence of *Dysdercus superstitiosus*, F. (spotted and banded form), *D. melanoderes*, Karsch, *D. haemorrhoidalis*, Sign. (here recorded as *D. ugandanus*, Schout.), and *D. fasciatus*, Sign., on plots of three varieties of cotton in two localities [*R.A.E.*, A, xvi, 233, 246].

The results are also shown of a similar attempt to secure comparative evidence of bollworm incidence, which was eventually abandoned as entailing too much labour. Tables are given showing the percentage of *Earias biplaga*, Wlk., *E. insulana*, Boisd., *Diparopsis castanea*, Hmps., *Heliothis obsoleta*, F., *Prodenia litura*, F., and *Argyroploce leucotreta*, Meyr., occurring on the buds and bolls of *Gossypium hirsutum* and two native varieties (*G. vitifolium* and *G. peruvianum*). Both cotton stainers and bollworms were more numerous on *G. hirsutum* than on either of the native varieties, *A. leucotreta* and *E. biplaga* being the most numerous of the latter. *E. biplaga* and *H. obsoleta* show a preference for buds, while *A. leucotreta* is much more numerous on the bolls.

Very few insects of economic importance were discovered in attempts to secure comparative data of species other than stainers and bollworms. Some adults of *Syagrus calcaratus*, F., were collected, a few plants showing signs of damage to the root system by the larvae. *Helopeltis* spp. were not found in any appreciable numbers. The open flowers of all varieties were infested by large numbers of a small black thrips, *Physothrips sjöstedti*, Tryb., in late September and early October, the damage caused, if any, not being estimated. Jassids were uncommon.

A list is given of all the insect pests of cotton in Nigeria with their parasites and predators.

LEAN (O. B.). **Comparative Observations of the Pests of Cotton at Ilorin, Northern Nigeria.**—*6th Ann. Bull. Agric. Dept. Nigeria*, pp. 127–143, 7 refs. Lagos, 1927.

In studies carried out at Ilorin in 1925–26 of four varieties of July-sown cotton, *Gossypium hirsutum*, *G. peruvianum*, and two varieties of *G. vitifolium*, the greatest number of locks were observed to be damaged by cotton stainers, which included *Dysdercus superstitiosus*, F., *D. haemorrhoidalis*, Sign. (here recorded as *D. ugandanus*, Schout.), *D. fasciatus*, Sign., and *D. nigrofasciatus*, Stål [*cf. R.A.E.*, A, xvi, 233]. *D. melanoderes*, Karsch, was not observed. More actual damage was caused, however, by bollworms, particularly to *G. hirsutum*, the species concerned being *Diparopsis castanea*, Hmps., which represented in some cases as many as 83·5 per cent. of all bollworms, *Earias biplaga*, Walk., and *E. insulana*, Boisd., 11 per cent., and *Argyroploce leucotreta*, Meyr., 5·5 per cent. Among miscellaneous pests of cotton, only a few individuals of *Helopeltis bergrothi*, Reut. and *H. sanguineus*, Popp., were observed, though *Helopeltis* has been reported to be numerous in past seasons. Adults of *Syagrus calcaratus*, F., were numerous on all varieties, particularly on bolls late in the season. A small percentage of damage to the roots by the larvae was observed only in the case of *G. hirsutum*. One block of *G. vitifolium* was seriously damaged by Jassids [*Empoasca facialis*, Jac.], which were not numerous on the other varieties, the infestation being probably due to the poor resistance of the plants. Aphids were present in only small numbers, while Coccinellids were abundant. Although a few scattered plants were infected, leaf-curl was of no importance. Since this disease has been infrequent when Jassids were abundant, it is now considered that Aphids rather than these insects are the probable vectors.

GHESQUIÈRE (J.). **A propos des faux-cotonniers congolais et de leurs possibilités culturales.**—*Rev. zool. afr.*, xiv, pt. 2, Suppl. bot., pp. B29–B44, 4 pp. refs. Brussels, 15th November 1926.

This account of the silk-cotton or kapok trees (Bombaceae) of the Belgian Congo, the most important of which is *Eriodendron anfractuosum* (*Ceiba pentandra*), includes a list of the insects that have been found attacking them in tropical Africa, the distribution and other food-plants of each being indicated. Of the 22 species listed, 14 attack cotton and 7 cacao, kapok being one of the most important food-plants of cotton and cacao pests. For this reason kapok should not be grown in districts suitable for these crops ; there are, however, large tracts of country unsuitable for cotton cultivation that are well suited for growing kapok.

FLETCHER (T. B.). **Report of the Imperial Entomologist.**—*Sci. Rep. Agric. Res. Inst. Pusa 1926–27*, pp. 56–67, 10 pls., 2 refs. Calcutta, 1928.

Sleeving experiments carried out with Lophopids of the genus *Pyrilla*, the Derbid, *Phenice* (*Assamia*) *moesta*, Westw., *Pseudococcus* sp. and Aphids, to ascertain if any of them were responsible for the spread of mosaic disease on sugar-cane, gave negative results in all cases. The Aphid, *Geoica spatulata*, Theo., which has previously only been recorded from Egypt, was found on cane stubble. The control measures for cane borers are discussed, and the spraying of the crop with a stomach poison to kill the early stages of the borers and the collection of the eggs are recommended.

The various kinds of borers attacking sugar-cane have been recorded in papers previously noticed [*R.A.E.*, A, ix, 69; x, 156]; as, however, it was impracticable, at that time, to name all the insects dealt with and many of the names have been found to have been misapplied, an amended list is published. Illustrations are given of the following species, which were described but not named in the previous report [ix, 69]: *Phragmatoecia purpureus*, sp. n. (purple coloured Zeuzerid borer); *P. terebrifer*, sp. n. (violet coloured Zeuzerid borer); *Chilo oryzae*, sp. n.(rice Chilo); *Diatraea kanra*, sp. n., *D. batri*, sp. n., and *D. ikri*, sp. n., previously recorded as *Chilo* spp.; *Chilo saccharicola*, sp. n., described as *Diatraea* sp.; and *Busseola sacchariphaga*, sp. n. Other species include: a Phycitid, apparently *Saluria spurcella*, Rag.; *Scirpophaga nivella*, F. (*xanthogastrella*, Wlk., *auriflua*, Zell.); *Schoenobius bipunctifer*, Wlk., which was previously referred to as *Chilo incertellus*, Wlk., a name that is preoccupied by *C. incertella*, Znk.; *C. zonellus*, Swinhoe, previously recorded as *C. simplex*, Butl.; *Argyria sticticraspis*, Hmps. (of which *A. coniorta*, Hmps., is the male), previously identified as *Diatraea auricilia*, Dudg.; and the true *D. auricilia* and *A. tumidicostalis*, Hmps. (*Chilo gemininotalis*, Hmps.), previously referred to as *Diatraea* spp.

Sticky bands as successfully used against *Monophlebus stebbingi* var. *octocaudatus*, Green, on fruit trees [*R.A.E.*, A, xiii, 607] did not prove effective as a control for a closely allied species of *Monophlebus* that infests *Albizzia lebbek*. During the last week of April and early May, the majority of the fertilised females were blown to the ground by strong west winds and very few were therefore caught in the bands. Oviposition took place in the ground, and the trees were heavily infested the following year. Sticky bands prepared with a proprietary substance or a mixture of resin and castor oil were then used to catch the young larvae ascending the trees and were found to be very successful, large numbers being killed on or below the bands by dusting with calcium cyanide; from 28th November 1926 to 16th January 1927 the paste was renewed four times and the dusting done twice.

Calandra (*Sitophilus*) *oryzae*, L., sometimes causes a loss of about 20 per cent. in stored grain. By the use of mercury, however, this was kept in good condition from May to the following January; and in experiments none of the eggs of various insects hatched when placed in stoppered phials in the middle of which a small tube of mercury was fixed, while those placed in control phials hatched in every case. The curling of the terminal leaves on the shoots of *Hibiscus cannabinus* on which numbers of a Capsid and of *Pseudococcus* sp. were observed was found to be due to the latter. A serious outbreak of *Diacrisia obliqua*, Wlk., occurred locally in 1926; the larvae, which usually attack all low-growing vegetation, were found for the first time on beetroot. Large numbers were hand-picked, and subsequently light-traps were used to attract the moths and the egg-masses were collected.

Other pests were: a species of *Phenacoccus*, possibly *P. insolitus*, Green, on brinjal (*Solanum melongena*); *Agrotis ypsilon*, Rott., noticed for the first time on the shoots of carrots; *Spodoptera mauritia*, Boisd., a serious outbreak of which occurred on rice; *Prodenia litura*, F., and *Hellula undalis*, F., which attacked cauliflower and were controlled by spraying with lead arsenate; a Lycaenid, *Jamides bochus*, Cram., which has not previously been recorded as a pest of *Citrus*, on oranges; and a Pyralid, *Margaronia marinata*, F., on *Cinchona*. A collection was made of numbers of *Myllocerus undecimpustulatus* var. *maculosus*, Desbr. (cotton white weevil) to breed out a Braconid parasite (? *Loxocephalus* sp.), which attacks the adult weevil. The weevils died soon after the emergence of the parasite larva, but no means have yet been found of detecting any external difference between parasitised and non-parasitised individuals.

[GHOSH (C. C.).] **Entomology.**—*Rep. Dept. Agric. Burma 1926–27*, pp. 12–13. Rangoon, 1927.

Insects studied during 1926–27 include *Schoenobius bipunctifer*, Wlk., and *Cirphis unipuncta*, Haw., on rice, hand-picking being recommended against the latter. Sugar-cane was attacked by *Alissonotum impressicolle*, Arr., the adults of which gnaw through the canes and kill the growing plant. The infestation was checked by hand-picking and ploughing up badly affected areas. A Lygaeid bug, *Antilochus coqueberti*, F., was observed to prey upon the red cotton bug [*Dysdercus cingulatus*, F.].

CORBETT (G. H.) & DOVER (C.). **Notes on Miscellaneous Insects of 1926.**—*Malayan Agric. J.*, xv, no. 11, pp. 408–419, 1 pl., 3 refs. Kuala Lumpur, November 1927.

This supplementary report on the pests of the Malay Peninsula [*cf. R.A.E.*, A, xv, 656] gives brief notes on 42 minor pests and 31 predacious and parasitic insects.

VAN DER GOOT (P.). **Het Crotalaria-wantsje.** [The Crotalaria Bug.]—*Korte Meded. Inst. PlZiek.*, no. 6, 18 pp., 3 pls., 5 refs. Buitenzorg, 1927. (With a Summary in English.)

The Capsid, *Ragmus importunitas*, Dist., the stages of which are briefly described, is becoming a serious pest of *Crotalaria anagyroides* and *C. juncea*, both important green manure plants in Java. *C. striata* and *C. incana* appear to be its original food-plants in Java; it also occurs in Celebes, Ceylon and India. The eggs are laid in the leaves, leaf-stalks and young top-shoots. The larvae hatch within ten days and reach the adult stage about twelve days later. The adults are usually short-lived, but some survived for fifty-five days. One female lays about eleven eggs. Three Hymenopterous egg-parasites were the only enemies observed; the most abundant is a small Mymarid, which at the beginning of the rainy season may be found in 70 per cent. of the eggs. Brief accounts of the biology of this parasite and of a Trichogrammatid are given.

Only three species of *Crotalaria*, *C. usaramoensis* (a valuable green manure plant), *C. alata* and *C. valetonii*, are immune from attack. Young plants of *C. anagyroides* are stunted in growth and often die, and sometimes the infestation has caused the cultivation of this plant to be abandoned. Dusting with calcium cyanide killed the adults and larvae, but not the eggs, so that treatment would have to be repeated frequently, which would probably make it too expensive. This Capsid might perhaps be controlled by clearing all its food-plants in the neighbourhood and keeping the ground free from self-sown plants for 8–10 weeks prior to sowing a susceptible species of *Crotalaria*. Otherwise *C. usaramoensis* or some other leguminous plant, such as *Tephrosia candida*, must be used.

YASAKI (M.). **On** *Acrocercops ficuvorella*, **sp. n.** [*In Japanese.*]—*Tech. Bull. Kagoshima Coll. Agric. & Forest.*, no. 6, pp. 1–7. Kagoshima, March 1926.

The larvae of the Tineid, *Acrocercops ficuvorella*, sp. n., mine in the leaves of figs in the southern half of Japan, pupation occurring in sheltered positions on the branches. There are apparently three generations a year.

IKEDA (N.). **On the Insects and Fungi detected at the Nagasaki Plant Quarantine Station during 1927.** [*In Japanese.*]—*Insect Wld.*, xxxii, no. 4, pp. 125–128. Gifu, April 1928.

Insect pests intercepted at Nagasaki during 1927 on plants from various ports, mostly on the Pacific Coast, include *Pseudococcus brevipes*, Ckll., *Cydia pomonella*, L., and *Cosmopolites sordidus*, Germ.

TAKAHASHI (S.). **A Treatise on the Insect Pests of Cultivated Crops.** [*In Japanese.*]—342 pp., 154 figs. Tokyo, Meibundo, March 1928.

This book contains accounts of the bionomics and control of about 80 of the more important insect pests attacking cultivated crops and stored grain in Japan. A new weevil, *Calandra sasakii*, sp. n., is described as injuring stored rice. It has 4 generations a year and winters in the larval stage. The optimum temperature for this weevil is 33° C. [91·4° F.], though that for *C. oryzae*, L., is 28 or 29° C. [82·4 or 84·2° F.].

A brief account is also given of the more important outbreaks of insect pests in Japan.

YAGO (M.). **Bait Control of** *Laspeyresia molesta*, **Busck.** [*In Japanese.*]—*Agric. & Hortic.*, iii, no. 3, pp. 163–168. Tokyo, February 1928.

Baits consisting of the juice of apple, pear or *Eriobotrya* with 2 parts water, or sugar with 20 parts water are attractive to *Cydia* (*Laspeyresia*) *molesta*, Busck (oriental peach moth) ; they are most effective if used 3 or 4 days after mixing. The males attracted to the bait slightly outnumber the females, which contain an average of 64·7 eggs. Late August and early September is the best time of the year for trapping the moths, and about 50 per cent. can be collected by this method in the field.

SONAN (J.) & SHIBATA (K.). **Biological Studies on** *Athalia japonica*, **Klug.** [*In Japanese.*]—*Trans. Nat. Hist. Soc. Formosa*, xviii, no. 94, pp. 49–64. Taihoku, Formosa, February 1928.

The sawfly, *Athalia japonica*, Klug, has 7 or 8 generations a year in Formosa, though only 2–5 occur in Japan. The larvae feed on cruciferous vegetables and are most numerous in December and January, but the injury caused is not so serious as in Japan. The adults are active on bright days, laying eggs singly in the tissues of young leaves along the margin ; they live for 20–37 days in captivity. The larvae hatch in 8–16 days and pupate 17–24 days later. Unfertilised eggs yielded only males.

NAKAYAMA (S.). **Studies on Insect Pests of Economic Importance in Korea.** [*In Japanese.*]—*Rep. Agric. Expt. Sta. Chosen*, iii, no. 1, pp. 1–3. Suigen, Korea, February 1928.

Brief notes are given on the following pests of rice in Korea: *Chilo simplex*, Butl., *Liburnia furcifera*, Horv., *L. oryzae*, Mats., and *Nephotettix apicalis*, Motsch., var *cincticeps*, Uhl.

MURAMATSU (S.). **On** *Dolerus ephippiatus*, **Smith, injurious to Wheat.** [*In Japanese.*]—*Rep. Agric. Expt. Sta. Chosen*, iii, no. 1, pp. 7–10. Suigen, Korea, February 1928.

The sawfly, *Dolerus ephippiatus*, Smith, is recorded as attacking various varieties of wheat in Korea, where it has one generation a year, the adults appearing from the end of March to the beginning of April. The eggs are inserted into the leaf on the lower surface near the apex and hatch in about 9 days. The larvae moult 5 times and hibernate in the soil until the following March, when pupation takes place.

BOURNE (A. I.) & WHITCOMB (W. D.). **The Codling Moth in Massachusetts.**—*Bull. Massachusetts Agric. Expt. Sta.*, no. 233, pp. 55–72, 2 pls., 2 figs. Amherst, Mass., March 1927.

Cydia (*Carpocapsa*) *pomonella*, L., has one complete generation and a partial second in Massachusetts, and these slightly overlap, so that from the time the fruit has set until harvest there are only a few days when infestation cannot take place. Some of the first generation larvae and all the second spend the winter in tightly woven cocoons, and pupation begins at the end of April or early in May, about the time the fruit buds are showing pink. The seasonal history, habits, and nature of the injury to apple are discussed [*R.A.E.*, A, xiv, 489]. Pears are also severely infested, while the fruits of peach, plum, cherry, quince and hawthorn are often attacked. Factors that tend to reduce the numbers of *C. pomonella* include birds, predacious insects and parasites (such as *Ascogaster carpocapsae*, Vier., and *Glypta varipes*, Cress.), and unfavourable weather, but these cannot be depended upon for satisfactory control. The usual measures supplementary to spraying are discussed, and a spray schedule for apples in Massachusetts is given. Sprays containing lead arsenate have proved on the whole more effective than dusts. The addition of nicotine sulphate against the eggs of *C. pomonella* appears to be uneconomical unless it serves to control other pests as well. Casein-lime is a satisfactory spreader and minimises the danger of foliage injury due to a combination of lead arsenate and lime-sulphur. In this connection notes on the choice of fungicides for combination with codling moth sprays, by W. L. Doran, are appended. Lime-sulphur is in general a satisfactory fungicide for apples, but if apple scab is not severe, 25 lb. dry-mix sulphur-lime (16 lb. fine sulphur, 8 lb. hydrated lime and 1 lb. casein-lime) to 100 U.S. gals. lead arsenate spray is equally effective and less likely to injure the foliage.

BOURNE (A. I.). **The Poisoning of Honey Bees by Orchard Sprays.**—*Bull. Massachusetts Agric. Expt. Sta.*, no. 234, pp. 74–84, 2 figs. Amherst, Mass., March 1927.

Laboratory experiments carried out in Massachusetts showed that while bees are strongly repelled by a mixture consisting of equal parts of honey and the regular spray combination (1½ lb. lead arsenate to 50 U.S. gals. water containing lime-sulphur, 1 : 40, and nicotine sulphate, 1 : 1,000), this mixture is nevertheless highly toxic to those that feed on it and very rapid in its action. A mixture of honey and lead arsenate alone was readily accepted by the bees, 50 per cent. dying within 48 hours ; lead arsenate combined with any of the other materials was also highly toxic. Lime-sulphur alone was much less toxic, while any mixture containing nicotine sulphate appeared to exercise a strong repellent action, which, however, persisted longer in the laboratory than in the field tests and appeared to vary according to the volatilisation of the nicotine. A mixture of lead arsenate and lime-sulphur was slightly repellent. Although in a greenhouse where no other blossom was available, the bees, after being at first repelled, worked in flowers sprayed with the regular combination and suffered heavy mortality, neither late pink nor early calyx spray, applied when there was considerable bloom on the trees, caused any serious mortality to colonies in sprayed orchards. In both cases the bees found an abundance of unsprayed blossom, the trees coming quickly into full bloom after the first spray, and the repellent action of the calyx spray causing them to work in unsprayed bloom in neighbouring orchards.

No high mortality occurred in experiments with trees enclosed in tents, except after the application of lead arsenate alone, there being always a supply of unpoisoned blossoms upon which bees repelled by the combined spray could work.

The experiments indicate that spraying with the recommended combination should have no appreciable effect upon colonies not subject to any restrictions of flight even when bloom is present, unless improperly timed spraying is carried out on a large scale.

ZECK (E. H.). **The Green Peach Aphid,** *Myzus persicae* **(Sulzer).**—*Agric. Gaz. N.S.W.*, xxxix, pt. 2, pp. 147–154, 11 figs., 12 refs. Sydney, February 1928.

Myzus persicae, Sulz. (green peach aphis), the various forms of which are described, was first recorded in numbers in New South Wales in 1910, but it has never been a very important pest there, except occasionally on peach trees in certain areas. The most serious damage is caused to the trees when the flower buds are opening in the spring. The Aphids, by sucking the sap, retard development of the twigs and fruit, curling and distorting the leaves in which they shelter and are protected from sprays. *M. persicae* should not be confused with *Anuraphis persicae-niger*, Smith, which is far commoner in New South Wales, overwintering normally on the roots of peach and being rarely found on any other plant. The food-plants of *M. persicae*, besides peach, which is the primary one, include a number of weeds and some cultivated flowers and vegetables, such as dahlias, roses, spinach, tomatos, peas, etc.

The stem mothers, which hatch from the overwintering eggs on peach, give rise to a generation of wingless, viviparous females, the next generation being winged and migrating to the secondary food-plants. Sexual forms fly back to the peach in autumn, and the female deposits the overwintering eggs. Observations indicate, however, that in the warmer districts of New South Wales the Aphids may overwinter on the secondary food-plants. Clean cultivation is, therefore, a great factor in control, and as an additional measure, an oil spray should be used on the peach trees in late winter or early spring (as soon as the buds begin to swell). Tobacco or nicotine washes will kill the Aphids if the leaves have not become so curled that the spray cannot reach them. During the summer, a tobacco wash of 25 lb. stalk or waste tobacco to 72 gals. of water, or 1 pint of nicotine sulphate to 100 gals. of water, or a nicotine dust may be used. One application, if early and thorough, should be enough ; a strong pressure and a coarse spray is required, and the nozzle should be held close to the foliage.

[KAZANSKIĬ (K. A.).] **Казанский (К. А.). Notes on the Biology of** *Agriotes obscurus* **and** *Athous niger*. [*In Russian.*]—*Défense des Plantes*, iv, no. 4–5, pp. 617–622. Leningrad, November 1927.

In the Leningrad Government the adults of *Agriotes obscurus*, L., are most abundant between 20th and 30th June and disappear entirely by 20th July, *Athous niger*, L., appearing a little later. *Agriotes* usually avoids the light, whereas *Athous* appears on the tops of graminaceous plants as soon as the sun shines and is seldom taken under clover placed in heaps as traps, under which *Agriotes* may be collected in large numbers. The latter lays its eggs towards the end of June in the soil in groups of 30–60 ; though it will lay them in any soil, a preference for loose soil is shown. *Athous* prefers more compact soil, oviposition occurring at the beginning of July. Both species apparently prefer soil with little or no vegetation and never lay eggs in densely covered soil. Under natural conditions the eggs hatch in 25 days. Under experimental conditions the young larvae fed on any available food, even flax and clover stems, and also devoured each other. In damp, clean sand they may live for 30–35 days without food, but only for 7–10 days in dry sand. In manured soil they will survive for over 3 months, provided that it has sufficient moisture ; otherwise they do not live more than 2 weeks. The optimum moisture content could not be ascertained ; when as a result of rain about 3 ins. of the top layer of the soil had become wet, the larvae went to a depth of about 8–10 ins. To determine the rate at which the larvae travel in the soil, some were confined in boxes with potatoes as baits placed at a distance of 39 ins. and a depth of about 4 ins. Even in boxes in which the soil was tightly packed all the larvae had reached the potatoes in 32–35 days, thus showing that heavy rolling, which is sometimes recommended as a control measure, is hardly likely to be effective.

The preferred food-plants of the larvae in order of preference are maize, oats, wheat, barley and rye ; lentils, millet,vetch and clover are not attacked even in the absence of other food, though clover has been recorded as a food-plant in England. The greatest injury is done when the plants appear above ground, the first node being attacked ; no injury to the plants after the stems have reached the hollow stage has been observed. Quick tillering varieties of cereals are better able to overcome the injury.

The time, density, and type of sowing do not affect the severity of attack.

Poison baits consisting of potatoes, etc., soaked in a solution of sodium arsenite did not prove satisfactory. Potatoes, carrots, beets, etc., without the poison, however, proved attractive to the larvae, potatoes being three times as attractive as any other baits. These baits were placed in the soil at a depth of 3½–7 ins. at intervals of 20 to 40 ins. Though collecting the larvae by this method is costly and laborious, it is strongly recommended for small experimental plots.

Samples taken from three-field and ten-field rotation plots showed the former to be much more heavily infested. The latter are recommended for the control of these pests provided that clover and flax are included in the rotation and perennial grasses, such as timothy, etc., are omitted. The following rotation is recommended for the south-western region: the first field, black fallow; second field, rye intersown with clover; third, 1st year clover; fourth, 2nd year clover; fifth, 3rd year clover; sixth, flax; seventh, fallow; eighth, rye; ninth, potatoes; and tenth, oats. This rotation has been tried over two years and has proved satisfactory both from an agricultural point of view and that of controlling the pests. Ploughing the fallow strips in July will kill some of the pupae, but is not very effective owing to the prolonged period during which the larvae pupate. In the case of *Agriotes obscurus*, this period extends from the beginning of July to the end of August, the pupal stage lasting 14–20 days. *Athous niger* pupates towards the end of May, and the adults emerge after 2–3 weeks.

[ENGEL'HARDT (V. M.).] **Энгельгардт (В. М.). Notes on the Biology of the Bud Leaf-roller,** *Steganoptycha ustomaculana*, **Curt., a Fruit-tree Pest in the Far Eastern Area.** [*In Russian.*]—*Défense des Plantes*, iv, no. 4–5, pp. 622–624. Leningrad, November 1927.

The buds of apple trees at the Khabarov Experimental Station (Eastern Siberia) were found to be infested by the small larvae of *Steganoptycha ustomaculana*, Curt. Pears were also attacked, the injury being particularly noticeable at the end of May when the petals of the uninjured buds fell. At this time the percentage of injury to apples was not more than 10 per cent., whereas on pears it reached an average of 30 per cent. The local wild apples and pears (*Pyrus manshurica* and *P. ussuriensis*) are apparently the primary food-plants of this Tortricid. Soon after the petals have fallen, the larvae attack the newly set fruit, preventing its further development. This injury amounts to at least 15 per cent. on pears and 5 on apples. When older fruit is attacked, it may ripen, though it will be deformed, but usually the attack causes exudation of juice, which attracts other insects such as *Liocola* (*Pachnotosia*) *brevitarsis*, Lewis, and *Bibio hortulanus*, L. Pupation occurs about the middle of June on the ground under dried leaves, etc., the pupal stage lasting 16–18 days. A second generation was not noticed, nor was oviposition observed, but it is probable that the eggs are laid on the trunk or branches and hatch early in the following spring.

[REÏKHARDT (A. N.).] **Рейхардт (A. H.). Description of a new Weevil from Bokhara.** [*In Russian.*]—*Défense des Plantes*, iv, no. 4–5, pp. 625–627. Leningrad, November 1927.

Magdalis (*Edo*) *myochroa*, sp. n., is described in Russian and German. The weevils occurred in large numbers on *Prunus divaricata*, completely skeletonising the leaves.

[SILANT'EV (I. M.).] **Силантьев (И. М.). The Beet Fly,** *Pegomyia hyoscyami*, **Panz.** [*In Russian.*]—*Défense des Plantes*, iv, no. 4–5, pp. 627–629. Leningrad, November 1927.

The importance of *Pegomyia hyoscyami*, Panz., as a pest of sugar-beet varies in different localities of South Russia. Parasites exercise considerable control, infestation reaching 60–98 per cent. in some cases. The author has bred an undetermined Chalcid from larvae reared in the laboratory; the parasites previously recorded in Russia are the Braconids, *Opius ruficeps*, Wesm., *O. nitidulator*, Nees, *Alysia picta*, Gour., and *Phaenocarpa pegomyiae*, Marsh., and the Chalcid, *Decatoma betensis*, Dec.

Pegomyia hyoscyami hibernates as a pupa in the soil or under the beet leaves, the adults emerging in the spring. In the Kiev (Ukraine) and Mogilev Governments oviposition begins at the end of April and beginning of May. It usually extends over 1–2 months, 1–12 eggs being laid on each leaf irrespective of its size. The larvae hatch in 2–4 days and immediately enter the parenchyma of the leaf. As many as 8 have been observed mining in one leaf; should the leaf begin to wither before the larvae have completed their development they migrate to another. In all the beet plants examined, only the outside, older leaves were attacked. The larval stage lasts 14–15 days, pupation usually occurring in the soil, though very occasionally in the leaf. Under laboratory conditions the pupae were never found deeper than 3–3½ ins. The pupal period lasts 18–27 days, the entire life-cycle thus occupying 34–46. Larvae of the second generation were found towards the end of August; at the beginning of September they all entered the soil.

The remedial measures against this fly have not yet been sufficiently worked out; those recommended by various authors are the destruction of infested leaves or crushing the larvae without destroying the leaves, the use of spinach as a trap-crop, and deep ploughing and harrowing in the autumn with a view to destroying the pupae. Spraying the beet leaves with barium chloride in varying concentrations gave promising results in laboratory experiments in 1913, over 48 per cent. of the larvae being killed [*cf. R.A.E.*, A, ii, 467].

[STARK (V. N.).] **Старк (B. H.). Clearing as a means of controlling** *Neotomicus suturalis*, **Gyll., in the young Pines in Areas of Natural Regeneration.** [*In Russian.*]—*Défense des Plantes*, iv, no. 4–5, pp. 630–636. Leningrad, November 1927.

The drought of 1919 and the subsequent years considerably reduced the underground water-level in the Bryansk forests. The great change in the moisture content of the upper layers of the soil combined with the dry atmosphere lowered the resistance of the young pine trees, predisposing them to attacks by *Ips* (*Neotomicus*) *suturalis*, Gyll.

Trap logs proved ineffective against the pest until they were tried in connection with other forestry practices, the most important of which was proper clearing. Though the data collected during the period 1919–1925 have not yet been thoroughly studied, the author recommends that trap logs (4–5 ins. in diameter) be laid out at the time of clearing. In the first place, all injured and deformed trees should be cleared, and 4–5 years later any infested trees. Where trap logs are used without clearing, the beetles prefer to attack the weakened standing trees, while clearing alone only causes the beetles to migrate ; in wooded areas they may fly about a mile from the centre of infestation and in cleared areas over 1½ miles.

[PISNYACHEVSKIĬ (A. A.).] **Писнячевский (A. A.). The Injury to Winter Cereal Crops in Relation to the time of Sowing in the Nizhniĭ-Novgorod Government in 1923-1926.** [*In Russian.*]—*Défense des Plantes*, iv, no. 4–5, pp. 636–655, 2 refs. Leningrad, November 1927.

The results of four years' phenological observations in relation to the injury caused by various insect pests to grain crops sown at different periods from August to October are discussed and tabulated. The duration and intensity of oviposition by the Swedish fly [*Oscinella frit*, L.] on these crops depend on meteorological conditions in the summer and autumn. A lowered autumn temperature reduces the fertility of the individual flies and is unfavourable to the eggs and larvae. The chief injury is usually caused by the first summer generation, as the second generation seldom develops sufficiently rapidly to infest the crops in the same year, though under exceptional conditions the flies may possibly survive long enough to attack these crops the following year. The second generation is seldom completed in the same year and may sometimes be entirely absent. It is favoured by a warm summer, resulting in an early appearance of the first summer generation followed by intensive egg laying, and by continued warm weather in September. When as in 1924 this second generation is completed, a large number of adults occur in the autumn, augmenting the damage done by the first generation.

The injury done by the gout fly [*Chlorops taeniopus*, Mg.] in relation to the time of sowing more or less corresponds to that of *O. frit.*

The Hessian fly [*Mayetiola destructor*, Say] caused more injury in autumn to rye than to winter wheat, though according to the literature under equal conditions the latter suffers more. During 1924 the rye developed more rapidly than the wheat and was therefore more suitable for attack by *M. destructor* and other pests in the autumn, but by the spring it had passed the most susceptible stage (2nd leaf phase) whereas the more slowly developing wheat plants appear to be more liable to attack by certain insect pests in the spring. The spring temperature is the determining factor in the emergence of *O. frit* and *C. taeniopus* from the cocoons. Other conditions being equal, their emergence will depend on what stage the insect reached before hibernation. While the three pests mentioned confine their attack in the spring to late developing winter crops, such pests as *Hylemyia coarctata*, Fall., *Opomyza florum*, F., *Prolasioptera* (*Lasioptera*) *cerealis*, Lind., and flea-beetles in some years appear to cause more injury to the earlier sown ones.

The results of these observations indicate that the time of sowing should be chosen with a view to reducing the autumn infestation by *Oscinella frit*. In this connection sowings at the end of August appear to be most satisfactory under local conditions and also coincide with general agricultural practices. This is also the most suitable time for sowing in case of a heavy outbreak of *Chlorops taeniopus*.

[VELICHKEVICH (A. I.).] **Величкевич (А. И.). Insects injurious to Onions in the Novgorod Government.** [*In Russian.*]—*Défense des Plantes*, iv, no. 4–5, pp. 717–728. Leningrad, November 1927.

A short account is given of the seasonal history of the following pests attacking onions in the Government of Novgorod: *Acrolepia assectella*, Zell., *Phytomyza nigra*, Mg., *Hydrellia griseola*, Fall., *Crioceris* (*Lema*) *merdigera*, L., *Barathra brassicae*, L., *Polia* (*Mamestra*) *pisi*, L., *Eumerus strigatus*, Fall., *Hylemyia antiqua*, Mg., and *Muscina stabulans*, Fall., which is presumably attracted by onions that are decaying as a result of attack by *A. assectella*. All these attack the leaves, though the larvae of the last three mainly attack the bulbs. The larvae of *A. assectella* are the first spring and summer pests of onions, the other insects appearing later. Remedial measures against it have already been noticed [*R.A.E.*, A, xii, 356]. Against the flies, the destruction of the eggs about 10 days after transplanting is recommended. For this purpose the soil for about 2½ to 3 inches around the plants is raked away, the onion wiped over with the finger and the space filled in with fresh soil containing a small percentage of sand and charcoal or powdered lime and soot, leaving the top of the bulb free. The soil should be mixed with kerosene at the rate of about 1½ pints to a bushel of soil. This measure should be applied 2–4 times during the first flight of the flies, and again at intervals of 7 days during the second flight beginning at the end of June.

As *H. antiqua*, *E. strigatus*, and *M. stabulans* may begin to lay eggs on the onions in the store or before they are transplanted, it is advisable that they should be treated before planting out. The various substances recommended by others for this purpose are enumerated, the best results being obtained with quassia. Watering at intervals of 4–5 days with carbolic acid emulsion has given good results against the eggs and larvae, and is to some extent repellent to the adults of *A. assectella* and other pests.

[YAKHONTOV (V. V.).] **Яхонтов (В. В.). Biology of *Ernestia consobrina*, Mg. (Diptera, Tachinidae) and Notes on its Economic Importance in North-western Russia.** [*In Russian.*]—*Défense des Plantes*, iv, no. 4–5, pp. 729–742, 1 fig., 4 refs. Leningrad, November 1927.

A detailed account is given of the bionomics of *Ernestia consobrina*, Mg., a parasite of Noctuids in north Russia. Of the various hosts, *Barathra brassicae*, L., is a pest of considerable importance, and it is believed that the value of this Tachinid might be increased by artificial propagation.

The larvae emerge from the eggs as they are deposited; only leaves harbouring host larvae or those injured by them are chosen for larviposition, which always occurs on the lower surface. Very rarely the larva may be deposited directly on the host. The larva attaches itself to the plant by means of the egg covering. As soon as a host larva crawls over it, the parasite larva attacks it and gradually bores into it. A recently deposited parasite will enter a third or fourth stage larva in about 20–40 seconds, but older larvae appear to be more tough. When the parasite is 2–3 days old, it takes much longer to enter the host and in some cases fails to do so completely and dies. Fully grown host larvae do not react to the attack of the parasite, but the younger ones make various efforts to rid themselves of it; these include rubbing themselves against some part of the plant or discharging on the parasite a greenish poisonous liquid from the mouth, and they sometimes succeed in shaking it off.

In north Russia the activities of the parasite appear to be confined to *Barathra* and *Polia*. As a rule only one parasite is reared from each larva, but the presence of another parasite does not prevent attack. Pupation occurs at the place where the parasite leaves the host larva in the soil; should the latter not yet have entered the soil, the parasite may bore down a little way or pupate on the soil surface. A variety of the Chalcid, *Rhoptrocerus mirus*, Wlk., has been reared from the pupae of *E. consobrina*.

[BOGDANOV-KAT'KOV (N. N.).] **Богданов-Катьков (Н. Н.). An Attempt at a Catalogue of Insects inhabiting Vegetables in Russia.** [*In Russian.*]—*Défense des Plantes*, iv, no. 4–5, pp. 742–751. Leningrad, November 1927.

This list of vegetable pests occurring in Russia, which does not claim to be complete, is arranged under the orders, giving the scientific and Russian names.

[ION (O.).] **Ион (О.). Pyrethrum.** [*In Russian.*]—*Défense des Plantes*, iv, no. 4–5, pp. 810–812. Leningrad, November 1927.

This is a short account of the recent development of pyrethrum as an insecticide and of its cultivation, which should be possible in the Crimea and Caucasus. The preparation of pyrethrum insecticides is briefly described.

PAPERS NOTICED BY TITLE ONLY.

BOUNHIOL (J. J.). **Contribution à l'étude anatomique de la larve du** *Leptinotarsa decemlineata* **(Say) (Doryphore de la pomme de terre).**—*Rev. Zool. agric.*, xxvi, no. 11, pp. 163–183, 8 figs., 9 refs. Bordeaux, November 1927.

HALLAGE (R.). **Expériences de destruction de criquets** [*Dociostaurus maroccanus*] **en Syrie.**—*Bull. agric. Algérie*, xxxiv, no. 2, pp. 35–36. Algiers, February 1928. [See *R.A.E.*, A, xvi, 153.]

SCHOUTEDEN (H.). **Le pink boll worm** [*Platyedra gossypiella*] **au Congo.**—*Rev. zool. afr.*, xv, fasc. 4, pp. [114]–[116]. Brussels, 15th February 1928. [See *R.A.E.*, A, xvi, 303.]

ROARK (R. C.). **Supplement to Chloropicrin Bibliography** [29 titles].—8 pp., mimeograph. Washington, D.C., U.S. Dept. Agric., Bur. Chemistry, May 1927. [*Cf. R.A.E.*, A, xiv, 628.]

[PETROV (A. F.).] **Петров (А. Ф.). The Effect of the Time of Sowing on the Control of the Hessian Fly in the Kursk Government according to Observations in 1924 and 1925.** [*In Russian.*] —*Défense des Plantes*, iv, no. 4–5, pp. 798–800. Leningrad, November, 1927.

Owing to the extensive injury by the Hessian fly [*Mayetiola destructor*, Say] to grain crops in 1923, which in some areas amounted to nearly 4,000 acres, it was decided to ascertain the latest safe dates for sowing. For this purpose the Government was divided into the north, south and central areas, the earliest dates recommended being 30th August in the north and 8th September in the south. These recommendations were followed with a few exceptions, and the results proved the value of this method in the control of *M. destructor*. The average infestation of the winter crops amounted to 1·8 per cent.

[OVCHINNIKOVA (M. I.).] **Овчинникова (М. И.). Results of Observations and Experiments on** *Chlorops taeniopus*, **Mg., during 1924-1926 in the Government of Nizhniĭ-Novgorod.** [*In Russian.*] —*Défense des Plantes*, iv, no. 4–5, pp. 655–717, 72 tables. Leningrad, November 1927.

During 1923 and 1924 *Chlorops taeniopus*, Mg., became unusually abundant in Russia. The history of this fly in other countries is very briefly reviewed ; its distribution apparently depends largely on the humidity of the atmosphere. Experiments and field observations near Leningrad and in Nizhniĭ-Novgorod show that there are two generations a year, the adults of the first appearing about the end of May and those of the second about the end of July or beginning of August. The activities of the flies are greatly reduced in cold, windy or rainy weather. They apparently feed on the nectar of flowering weeds and other plants ; under experimental conditions they readily accepted a solution of sugar. The general habits and various stages are described.

The adults do not always emerge from the pupae with fully developed ovaries. Their development requires a sufficiently high temperature prior to emergence as well as for a few days afterwards and also a corresponding humidity ; thus during 1924 the adults of the second generation began to lay eggs on the second day after emergence near Leningrad, but in the Moscow and Nizhniĭ-Novgorod Governments, where the soil temperature rose to 45° C. [113° F.] and the humidity fell to 37% the flies required at least two weeks' additional feeding before egg-laying. The duration and intensity of oviposition also depend on weather conditions. The maximum number of eggs laid by one individual was 112 for the first and 120 for the second generation.

The process of oviposition is described ; almost any part of the young plant may be selected, though plants in the two leaf phase are most suitable. When eggs are laid on older plants, the majority are on the youngest leaf. As the growth of the plant advances, fewer eggs are laid on the sheath and a greater proportion on the blade of the leaf. On spring-sown wheat the lower side of the leaf is preferred, presumably in order to protect the larvae from the sun and lack of humidity, since in the autumn, when the temperature is lower, most of the eggs are laid on the upper surface. The older plants, besides being less suitable for the young larvae, present a larger surface for them to cover before reaching the stalk, and the larvae are thus more exposed to the sun. Only ear-forming grains are chosen for oviposition ; these include wheat, rye, barley, timothy grass, etc. The order of preference was barley, *Agropyrum* (*Triticum*) *repens*, and spring-sown wheat. Oats, which have been recorded as a food-plant, were never found to be attacked.

The average incubation period is 6–5 days, depending on temperature and humidity. Under experimental conditions, even when the soil temperature reached 35·1° C. [95·2° F.], the eggs hatched in 5–6 days, provided that there was sufficient moisture. In a dry environment some of the eggs did not hatch, and the larvae did not cause any injury to the stems, as they apparently succumbed to the excessive dryness. The method of entry into the stalk is described. The larvae do not migrate from one stalk to another, but if carefully transferred, they will develop normally. The larvae destroy each other, only one developing in each stalk. In Leningrad the larval stage of the first generation lasted 21–26 days, with an average of 23.

Pupation usually occurs on the injured ear or at its base and lasts about 10–19 days, making the total development period near Leningrad about 36–53 days. In Nizhniĭ-Novgorod the life-cycle varies from 62 to 69 days. The winter is usually passed as a second or third instar larva. Both larval and pupal mortality is lower on winter rye than on winter wheat, and it is also lower on the later sowings of both crops. The injured stems of winter wheat disintegrate quicker than those of rye and are therefore unsuitable for the hibernating larvae. In the case of the later sown crops, owing to later attack, hibernation occurs before the stems become unsuitable. During 1926, owing to the damp spring, the injured stems died rapidly, so that a large percentage of the pupae was destroyed.

The parasites recorded include the Chalcid, *Stenomalus micans*, Oliv. It lays its eggs on the host larva, which is destroyed before pupation. The pupa of the parasite lies in the infested stem of the young plant or in the furrow at the base of the ear. The adults appear during the latter half of the flight period of the corresponding generation of the host. Near Leningrad the parasitism of the summer generation of *C. taeniopus* amounted to 71·2 per cent. in 1923 and only 0·92 per cent. in 1924.

The reactions of various plants in different stages caused by the feeding of *C. taeniopus* are discussed. The larvae feed on the young parts of the plant and attack the point of growth from above, causing thickening of the stem. On spring-sown wheat the young ear is reached by the second instar larva, which descends in a straight line to its base, feeding on the tender portions on the way. The larva continues to descend and feed until it almost or quite reaches the first node, which, however, is never attacked, as it is too tough. The injury to the stems is evident 10–12 days after the larvae have hatched. Early sown winter crops appear to be the main source from which the flies appear in the spring. Some of these flies reinfest the winter crops, and others attack those sown in the spring. The seasonal history of *C. taeniopus* in relation to the injury caused to the crops sown at different periods, etc., is described in detail.

The following is taken from the author's summary : The adults of the overwintering generation oviposit on winter and spring-sown wheat and barley. The younger plants of late sowings of wheat are more severely injured than the earlier ones. Early sown crops have usually passed the susceptible stage by the time the maximum oviposition period is reached. The adoption of early sowings of spring wheat as a control measure against *C. taeniopus* has no disadvantages from the agricultural point of view, particularly as such sowings usually produce a heavier crop. In the case of winter crops the late sowings are most heavily attacked. Other conditions being equal, winter wheat is more heavily infested than rye. The effect of the injury on the resulting crop depends on the phase at which the plant is injured ; the older ones and those that develop more rapidly are better able to overcome the attack. Apparently the morphological peculiarities of certain plants have some effect on oviposition and subsequent injury.

RUSZKOWSKI (J.) & ZALESKI (K.). **Próby zwalczania niektórych chorób i szkodników drzew i krzewów owocowych i ozdobnych przeprowadzone w roku 1927.** [Experiments in the Control of Pests and Diseases of various Fruit Trees and Fruit and Ornamental Bushes in 1927.]—*Rocz. Nauk. roln. leśn.*, xix, reprint, 24 pp. Posen, 1928.

This is an account of experiments with various proprietary insecticides and fungicides.

MINKIEWICZ (S.). **Studja nad miodówką jabłoniową** (*Psylla mali* **Schmidberger). Część ii. Rozwój i biologja.** [*P. mali*, Schmid. Part ii. Development and Biology.]—*Mém. Inst. nat. polon. Econ. rur. Pulawy*, A, viii, pp. 457–528, 5 pls., 29 refs. Pulawy, 1927. (With a Summary in English.)

Part i of this paper has already been noticed [*R.A.E.*, A, xiii, 215 ; xiv, 108]. An account is here given of observations on the bionomics of *Psylla mali*, Schmid., in Poland, from 1920 to 1926, which are compared with the results of other workers in other countries.

The apple is the chief food-plant, but pears are constantly though slightly attacked. Oviposition occurs from the beginning of September to the end of October, the eggs being laid chiefly in crevices and cracks of the bark of the smaller twigs, sometimes even on the bud scales. They hatch in the spring when the buds of most varieties of apple are open, the date depending mainly on the temperature conditions in spring and the end of winter. It is possible that the first eggs laid in the autumn pass the first stage of development before hibernation (some eggs collected in December were in an advanced stage of development) and may therefore hatch earlier in spring than the others. The structure and function of the labium in the larvae and the general appearance of the other stages are described. The number of larvae in a bud varies ; in years of great abundance as many as 100 or more may be found. They remain in the bud with their heads towards its base. The nymphs appear on the under surface of the leaves. The duration of the larval and nymphal instars varies in different years from 28 to 44 days. The injury caused by the sucking of the larvae results in a shrinking of the leaves, and the tips of the shoots wither and the blossoms die.

The immature stages of *P. mali* are attacked by the Capsids, *Heterocordylus genistae*, Scop., *Plagiognathus arbustorum*, F., and *Orthotylus marginalis*, Reut. ; the Anthocorid, *Anthocoris nemorum*, L. ; the

Syrphids, *Syrphus auricollis*, Mg., *S. vitripennis*, Mg., and *Platychirus peltatus*, Mg.; the Tachinid, *Ptychomyia parallela*, Mg.; and Coccinellid larvae.

HENDEL (F.). **Eine neue europäische** *Lonchaea*-**Art, deren Larve Borkenkäfer-Räuber ist.** [A new European Species of *Lonchaea*, the Larva of which preys on Bark-beetles.]—*Konowia*, vii, no. 1, pp. 37–39. Vienna, 20th March 1928.

Lonchaea seitneri, sp. n., is described from the Tyrol, where its larva preys on the larvae and pupae of *Ips amitinus* in *Pinus cembra*.

PRIESNER (H.). **Die Thysanopteren Europas. Abteilung iv.**—pp. 569–755. Vienna, Fritz Wagner, 1928. Price *M*.19·25.

This is the final part of this treatise [*R.A.E.*, A, xiv, 308; xv, 64; xvi, 11]. The main section on specific morphology and classification is completed, including descriptions of three new species and nine new forms. The bibliography chiefly records papers on the Palaearctic and Nearctic species of thrips. An index to the families, genera and species is included.

SHULL (A. F.). **Duration of Light and the Wings of the Aphid** *Macrosiphum solanifolii*.—*Arch. EntwMech. Organ.*, cxiii, no. 1, pp. 210–239, 12 refs. Berlin, 17th March 1928.

Previous work on the effects of light and darkness on wing-production in Aphids is reviewed. In the experiments here described, wingless females of *Macrosiphum gei*, Koch (*solanifolii*, Ashm.), when reared in continuous electric light, produced almost exclusively wingless offspring, and the effect of almost continuous darkness was similar though a little less marked. Winged Aphids were produced by parents exposed to alternating light and darkness, the percentage of winged individuals depending on the daily number of hours of light. Winged parents responded in the same manner to alternating light and darkness, though there was a stronger tendency for their offspring to be wingless. Starvation of the parents in darkness had no effect on their offspring, but starvation in light not only caused the production of many winged offspring, but produced that effect very quickly. This and other observations indicate that wing-determination occurs in the young Aphids within the last two days or less before birth. Young Aphids an hour or two after birth were incapable of being altered. From further experiments it appears that the periodicity of light acts directly upon the Aphids and not indirectly through any change in the photosynthesis of the food-plant.

SPRENGEL (L.). **Untersuchungen über Zustand und Entwicklung der Eier in den Ovarien geschlüpfter Lepidopteren.** [Investigations on the Condition and Development of the Eggs in the Ovaries of emerged Lepidoptera.]—*Anz. Schädlingsk.*, iv, no. 3, pp. 25–30, 4 figs., 1 ref. Berlin, 15th March 1928.

To ensure the correct timing of measures against the vine-moths, *Clysia ambiguella*, Hb., and *Polychrosis botrana*, Schiff., bait-traps are used in the Rhine Palatinate. At the beginning of the flight-period, the ovaries of the females contain immature eggs only; at the end of the flight-period, all the females taken have completed oviposition.

The literature contains conflicting information on the number of mature eggs in the ovaries at the date of emergence in Lepidoptera, and no information is available regarding conditions later on. The author has investigated these in normal bred females of *Lymantria* (*Liparis*) *monacha*, L., *Porthetria* (*Liparis*) *dispar*, L., *Dendrolimus pini*, L., *Notolophus* (*Orgyia*) *antiquus*, L., and *Panolis flammea*, Schiff. (*Noctua piniperda*, Panz.). A brief description of the female genitalia is given, and the number of eggs found at various times up to 24 hours after emergence is recorded for each of the species named. At the time of emergence the ovaries contained both immature and mature eggs, and some of the latter were already in the oviduct. After emergence, immature eggs are still produced, but only a proportion of those present at emergence become mature.

SEIFF (W.). **Das Verhalten der Kiefernspanner-Weibchen bei der Eiablage.** [The Behaviour of the Female Pine Moth during Oviposition.]—*Anz. Schädlingsk.*, iv, no. 3, pp. 35–36, 2 figs. Berlin, 15th March 1928.

The oviposition habits of *Bupalus piniarius*, L., are described. The eggs are laid on the pine needles, oviposition beginning 1–3 days after mating, and in 3–5 days the supply of eggs is exhausted.

MÜLLER (K.). **Die Gallenreblaus in Baden.** [The Gall Form of *Phylloxera* in Baden.]—*Weinbau u. Kellerw.*, vi, 1927, pp. 187–188. (Abstract in *Centralbl. Bakt.*, (2) lxxiv, no. 1–7, p. 138. Jena, 26th March 1928.)

In September 1927 the shoots, older leaves and branches of some Taylor vines in Baden were noticed to be heavily infested with the aerial forms of *Phylloxera*, the root forms only having been previously known from Germany. These were examined by Börner and stated to be *P. vastatrix*, Planch. [Börner's northern form]. There were no galls on European vines. Although it has previously been thought that the winter or sexual eggs could not withstand the German winter, this discovery is disquieting as the young gall Aphids can wander about. The galls contained both aerial and root forms (the latter hibernating in the ground) so that the danger of spread of the infestation is greater than if root forms alone occurred. The Taylor vine is thus capable of giving rise to a rapid spread of infestation.

RAMBOUSEK (F.). **Die Motte *Ephestia elutella* Hb., ein neuer Schädling des Rübensamens.** [The Moth, *E. elutella*, a new Pest of Sugar-beet Seed.]—*Z. Zuckerind. čsl. Repub.*, li, pp. 533–534, 2 figs. Prague, 1927. Reprinted in *Ber. ForschInst. čsl. Zuckerind.*, xxxi, pp. 113–115, 2 figs. Prague, 1928.

The larvae of *Ephestia elutella*, Hb., all stages of which are described, are recorded as infesting the seeds of sugar-beet. Stored seed may be protected by lightly spraying the outside of the sacks with nitrobenzene, or the sacks may be dusted with trichlorobenzene, or a little of the latter may be mixed with the seeds. Where infestation is already present, fumigation with carbon bisulphide may be employed. Equal parts of sawdust, flowers of sulphur and saltpetre may be burned in the middle of the store-room, which must be aired 24 hours afterwards. If any moths appear during this work, the fumigation must be repeated because any eggs that may be present will not be affected. The windows should be screened with a gauze of 2 mm. mesh to prevent the ingress of moths.

MATTES (O.). **Parasitäre Krankheiten der Mehlmottenlarven und Versuche über ihre Verwendbarkeit als biologische Bekämpfungsmittel.** [Parasitic Diseases of the Larvae of the Meal Moth and Experiments on their Application as biological Measures.]—*SitzBer. Ges. Beförderung Naturw. Marburg*, lxii, pp. 381–417, 7 figs., 1 pl. Marburg, 1927. (Abstract in *Centralbl. Bakt.*, (2) lxxiv, no. 1–7, p. 156. Jena, 26th March 1928.)

The larvae of *Ephestia kühniella*, Zell., can be easily infected by the mouth with *Bacillus thuringensis*, the spores multiplying internally and causing death. If the larvae are protected by webs, they are not infected by dusting with flour containing the spores. This protection also applies to other parasitic agents, such as *B. agilis*, sp. n., which is pathogenic under favourable conditions. Two other new micro-organisms from these larvae are also described.

GASOW (H.). **Die Frühdiagnose des Auftretens der Azaleenmotte.** (*Gracilaria azaleella*, **Brants.**) [The early Determination of the Presence of the Azalea Moth.]—*Arb. biol. Reichsanst.*, xv, no. 5, pp. 593–599, 5 figs., 13 refs. Berlin, January 1928.

After a brief historical note on the occurrence of *Gracilaria azaleella*, Brants, on azaleas in Europe [*R.A.E.*, A, xii, 542; xiii, 67; xiv, 194], it is pointed out that any regulation against the importation into Germany of plants infested by this Tineid presupposes the detection of its presence in the egg and larval stages. A description is given of the process of oviposition and of the eggs and the method by which their presence may be detected [A, xv, 558]. The leaf-mines made by the newly hatched larvae appear silvery white or silver grey by reflected light, but are invisible by transmitted light. A detailed account is given of the appearance of the mines of the various larval instars. The fifth instar larva leaves the mine and prepares a shelter by gnawing on the underside of the leaf so as to form a cornet-shaped bag.

RETTICH (—). **Das Auftreten von schädlichen Forstinsekten in den Kiefernbeständen des badischen unteren Rheintals, im besonderen der Kiefernbuschhornblattwespe** (*Lophyrus pini*, **L.**) **im Jahre 1927.** [The Occurrence of injurious Forest Insects in the Pine Stands of the lower Rhine Valley in Baden, and particularly of the Pine Sawfly, *Diprion pini*.]—*Badische Bl. angew. Ent.*, ii, no. 5, pp. 249–261, 7 figs. Freiburg i. Br., March 1928.

The extensive unmixed pine stands in the lower Rhine Valley in Baden afford favourable conditions for outbreaks of pests. Those observed in 1927 include *Myelophilus piniperda*, L., and *M. minor*, Hart., the former of which is especially harmful after an outbreak of caterpillars; *Hylobius abietis*, L., which is particularly injurious to young plantations; and *Melolontha melolontha*, L. (*vulgaris*, F.) and *M. hippocastani*, F., the larvae of which attack the roots and cause a large amount of damage. More important still were *Dendrolimus* (*Bombyx*) *pini*, L., *Panolis flammea*, Schiff., and *Rhyacionia* (*Tortrix*) *buoliana*, Schiff. A serious outbreak of the sawfly, *Diprion* (*Lophyrus*) *pini*, L., occurred, and the greater part of this paper is devoted to it [*R.A.E.*, A, xvi, 342].

KRAUSS (H. A.). **Der Messingkäfer** (*Niptus hololeucus*).—*Badische Bl. angew. Ent.*, ii, no. 5, pp. 264–267. Freiburg i. Br., March 1928.

In view of the attention recently attracted by the Ptinid, *Niptus hololeucus*, Fald., in Germany [*R.A.E.*, A, xvi, 214, 215, 289] records of its occurrence in various countries are reviewed. The measures advocated against it are fumigation with hydrocyanic acid gas, the collection of the beetles and trapping them in damp cloths placed on the walls and floors, and the treatment of places where the larvae shelter by heat or by fumigation with carbon tetrachloride, etc.

GEINITZ (B.). **Zur Biologie des Messingkäfers.** [On the Biology of *Niptus hololeucus*.]—*Badische Bl. angew. Ent.*, ii, no. 5, pp. 269–274, 3 figs. Freiburg i. Br., March 1928.

Most of the information given here has been taken from the literature [*R.A.E.*, A, xi, 141 ; xvi, 215, 289]. The author has kept *Niptus hololeucus*, Fald., under observation from the autumn to March. Some individuals of both sexes were capable of reproduction throughout that period, and all developmental stages from the egg onwards were present all the time.

SPEYER (W.). **Zur Frostspannerfrage.** [On the Question of *Cheimatobia brumata*.]—*Badische Bl. angew. Ent.*, ii, no. 5, pp. 282–284. Freiburg i. Br., March 1928.

It is pointed out that the larvae of the winter moth, *Cheimatobia brumata*, L., attack a variety of trees and are in the habit of dropping attached to a thread when they are disturbed or when they meet with an obstacle, so that they are easily carried by the wind. Banding should not, therefore, be limited to fruit-trees, or the latter may be thus infested by caterpillars from other trees.

HIMMELSBACH (F.). **Versuche zur Bekämpfung technisch schädlicher Holzinsekten.** [Experiments in combating Insects harmful to worked Timber.]—*Badische Bl. angew. Ent.*, ii, no. 5, pp. 284–286, 2 figs. Freiburg i. Br., March 1928.

This preliminary note describes experiments in which air-dried timber was impregnated with mercury bichloride by the ordinary method of soaking and by a patented method in which the wood is subjected to a preliminary treatment causing the solution to penetrate deeper and thus prove more effective.

Wilson (G. F.). **Two lesser known Pests of Fruit Trees.**—*Gdnr's. Chron.*, lxxxiii, no. 2163, pp. 416–418, 5 figs., 9 refs. London, 9th June 1928.

Considerable damage has been done to fruit-trees in the south-east of England during the past three seasons by the weevil, *Rhynchites aequatus*, L., and the larvae of the Tineid *Hemerophila* (*Simaëthis*) *pariana*, Cl. Notes are given on their food-plants and distribution ; in England *R. aequatus* attacks apple, quince and hawthorn. The weevils are diurnal feeders, flying in May and June and ovipositing in the young fruit. The eggs hatch in about 14 days, and the larvae at once begin to feed in the fruit, which usually falls to the ground, in which the larvae bury themselves to pupate. The larval stage may last 3 or 4 weeks, but many larvae remain inactive in the soil for several months before pupating. Twelve mature larvae kept under controlled conditions remained inactive in the soil from June 1926 to June 1927, when they pupated, and emerged as adults in April 1928. The best methods of control are collecting and destroying the fallen fruits and jarring the trees and collecting the weevils that fall. Poultry are useful in clearing up the fallen weevils during jarring operations.

In the south-east of England the chief food-plants of *H. pariana* are apple and ornamental species of *Pyrus*. In England it has two broods a year, one in May and June, the other in July and August. The eggs are generally laid on the lower surface of the leaves and hatch in 5–7 days. The larvae feed together under the shelter of a web until mature, when they scatter over the plant prior to pupation. The infested foliage becomes russet coloured and the leaves are skeletonised. The pupal stage lasts about 14 days. The larvae are parasitised by the Braconid, *Apanteles longicauda*, Wesm., and the Ichneumonid, *Mesochorus tachypus*, Hlmgrn. The most successful control is spraying with lead arsenate or nicotine and soap before the larvae spin their webs. Handpicking the nests is also useful, and shaking the trees dislodges the larvae.

Leonardi (G.). **Elenco delle specie di insetti dannosi e loro parassiti ricordati in Italia fino all'anno 1911. Parte III. Insetti parassiti di altri insetti.** [Catalogue of injurious Insects and their Parasites recorded in Italy to the Year 1911. Part III. Insect Parasites of other Insects.]—159 pp. [Portici, R. Scuola sup. agrar.] 1928.

This part of this catalogue [*cf. R.A.E.*, A, xv, 481, etc.] consists of a list of predacious insects and parasites, showing the insect pest that they attack. The localities are not shown, though a footnote states that the list includes some species from other countries besides Italy. A brief list of mites, fungi, etc., that attack insects is given in an appendix.

Jones (G. H.) & Mason (T. G.). **On two obscure Diseases of Cotton.**—*Ann. Bot.*, xl, no. 160, pp. 759–772, 1 pl., 6 figs., 12 refs. London, 1926.

During a study of leaf-roll and leaf-curl of cotton in Nigeria, it was observed that Jassids were abundant in May, and it appeared probable that these insects might act as vectors of leaf-curl. When, however, cotton plants were grown in muslin cages and Jassids collected from diseased plants were introduced, none of the plants became infected. Though it is possible that the shade inside the cages suppressed the symptoms of the disease, this appears unlikely.

van der Meer Mohr (J. C.). **Proeven met Arseen-Preparaten ter bestrijding van de rupsenplaag in de tabak genomen door het Deli Proefstation in de jaren 1926 en 1927.** [Experiments with Arsenicals against Caterpillar Pests of Tobacco undertaken by the Deli Experiment Station in 1926 and 1927.]—*Meded. Deli Proefst.*, (2) no. 51, 34 pp., 6 figs. Medan, 1928. (With a Summary in English.)

In 1926 and 1927 various insecticides were tested on several tobacco estates in Deli, Sumatra, against Lepidopterous larvae in the field and in the drying sheds. In field experiments sprays and dusts containing a proprietary calcium arsenate proved as effective as lead arsenate and less expensive, but the possibility of their causing more foliage injury was not determined. In another series of experiments the addition of soap (0·2 per cent.) or saponin (0·1 per cent.) to a lead arsenate spray did not show any advantage. A zinc arsenite dust was effective, but in an 8 per cent. mixture it caused more scorching than Paris green (¾ to 1 per cent.). The results of dusting in the drying sheds were not satisfactory, only about 5 per cent. less of the dusted tobacco being injured by caterpillars than of the undusted.

van der Meer Mohr (J. C.). **Eenige minder belangrijke beschadigingen van Deli-tabak door dierlijke vijanden. A. Slakken. B. Behangersbijtjes.** [Some less important Injuries to Tobacco in Deli by Animal Enemies. A. Snails. B. Leaf-cutting Bees.]—*Meded. Deli Proefst.*, (2) no. 52, 8 pp., 3 pls. Medan, 1928. (With Summaries in English.)

What is believed to be the first case of an attack on tobacco in Deli, Sumatra, by leaf-cutting Megachilid bees is briefly described. The only other Hymenopterous pest of any importance on tobacco in Deli is the ant, *Solenopsis geminata*, F., which carries away the seed from the seed-beds.

Hazelhoff (E. H.). **Bepaling van de schade, aangericht door de topboorders van het suikerriet.** [The Estimation of the Loss caused by the Tip Borers of Sugar-cane.]—*Algem. Synd. Suikerfabrikanten Ned.-Ind., Handel. tiende Congr. (1928)*, Eerste Gedeelte, Prae-Adviezen, Aflev. 10, 20 pp., 1 fig. Soerabaya, 1928.

The application of any measure against a crop-pest should be preceded by an investigation to ascertain if the injury warrants the expense. While the requisite data are not available for sugar-cane tip borers, this paper indicates the lines to be followed for obtaining them. *Scirpophaga intacta*, Sn., is the most important species, those of less consequence being *Chilo infuscatellus*, Sn., *Grapholitha schistaceana*, Sn., and *Sesamia vuteria*, Stoll (*nonagrioides*, Lef.). In the case of the stem-borer, *Diatraea striatalis*, Sn., exact estimates of the losses can be made. In one locality in Java infested cane-fields produced 26 per cent. less sugar than uninfested ones, and in 1927 at least 2·83 per cent. of the total cane crop in the island was lost through it.

Jarvis (E.). **Paradichlorobenzene for combating Cane Grubs. Introduction and Past History.**—*Queensland Agric. J.*, xxix, pt. 2, pp. 97–107, 5 pls. Brisbane, 1st February 1928.

Past experiments with paradichlorobenzene against *Lepidoderma albohirtum*, Waterh. (greyback cane beetle) are briefly reviewed, and a detailed description of this soil fumigant is given together with the methods, time and cost of applying it. Much of the information has already been noticed.

During dry summer weather, dosages of ¼ oz. paradichlorobenzene buried 7 inches deep in cultivated soil retained their effectiveness for a period of about 6 weeks, but a similar amount evaporated completely in 15 days when exposed directly to air and daylight at an average shade temperature of 84° F. As the rate of diffusion depends on the temperature of the soil, the best results are likely to be obtained from November to January, when the average shade temperature varies from 70 to 80° F. The fumigant may be applied by means of a corn-planter adapted to inject uniform dosages of dry nodules close to rows of cane at regular depths and distances apart, the soil above the holes being at the same time levelled and consolidated by means of a special roller attached to the machine ; by using a hand injector (the best results were obtained on experimental plots where this method was used) ; or by dropping the dose by hand at regular intervals along an open furrow ploughed close to the rows of cane and covering with earth. Before application, all large lumps of paradichlorobenzene should be crushed and the whole passed through a sieve with a ¼-inch mesh. By dissolving paradichlorobenzene in liquid media such as carbon bisulphide or carbon tetrachloride, its long sustained toxic action, which is its most desirable quality as a soil fumigant, is practically destroyed, and the toxicity of the solvent is not greatly changed, while the cost is increased by employing two insecticides where either used alone would be satisfactory.

When ratoon crops 3–4 ft. high are treated by a machine, a dosage of 5¼ scruples might be used. For plant cane 1–2 ft. high the dosage should be about 3 scruples and for smaller cane 2 scruples. In each case these quantities should be applied 5–6 inches from the nearest cane shoots, 15–18 inches apart, about 4½ inches deep and on both sides of the rows. The best time for treating late-planted cane and ratoon crops is from the middle of December to the end of January, when the soil is not too wet and the larvae are still in the first and second stages. If the emergence of the beetles is delayed until December, fumigation may be carried out about the middle of January. Treatment should never be made after the commencement of the wet season, when the grubs have started noticeably to damage the crop, since in low-lying situations, or in areas where the cane is high enough completely to overshadow the ground between the rows, the water in the interstices of the soil will prevent the passage of the fumes. The best time to begin fumigation in light, friable, volcanic soils is 4–5 days after a fall of about 3 inches of rain, in sandy soils after about 2–3 days, and in clay loams or sandy loams after about 6 days if the land is well cultivated and drained. Fumigation of heavy clay soil is seldom advisable unless it is very well cultivated, treated with organic manures and thoroughly drained, but fortunately this class of soil rarely becomes infested. If rain occurs after the application of the fumigant, the crystals of paradichlorobenzene, being very slightly soluble, simply remain in the soil and do not begin to evaporate until the excess moisture has drained away. The soil should not be fumigated when it is very dry. Experiments have shown that the cane is not injured or stunted by fumigation, and in one case the cane on treated plots was taller than on untreated and uninfested plots, and in another the percentage of sugar obtained was higher. Only one treatment a year is necessary. The paradichlorobenzene should be kept in air-tight tins to prevent evaporation. A list of other insects against which it may be used is given.

[JARVIS (E.).] **Destroying Cane Grubs with Carbon Bisulphide.**—*Queensland Agric. J.*, xxix, pt. 2, pp. 107–113, 3 figs. Brisbane, 1st February 1928.

The application of carbon bisulphide against *Lepidoderma albohirtum*, Waterh., is discussed. In well-aerated soils its fumes spread laterally and downward, paralysing and suffocating all insects within a radius of about 9 inches from the point of injection. Injections should be made when the first inch or two of the soil is firm or slightly caked and the soil below the surface is in a moist, well-drained and open condition. The ground should not be cultivated for a fortnight before and after fumigation. After heavy rain, highland volcanic soil or coarse sandy loams should be fumigated in 4–5 days, clay loams or fine sandy loams in 6 days where the land has been well worked and drained, and sandy soils in 2–3 days. This fumigant can only be applied by means of an injector. For young plant or ratoon cane on friable soils, doses of 3 scruples should be injected 3–4½ inches deep and 18 inches apart on both sides of rows planted 5 feet apart. In the case of older plant or ratoon crops on clay loams or light soils, it is advisable to make the injections 12 inches apart instead of 18. The application of carbon bisulphide greatly improves the fertility of the soil. Fumigation should be carried out from about the middle of December to the end of January, while the cane shows no signs of infestation. Carbon bisulphide should not be applied until the stools are well established and the cane about 2 ft. high.

In an addendum to this paper, a brief outline is given of laboratory experiments with calcium cyanide against the larvae of *L. albohirtum* and *Lepidiota frenchi*, Blkb., and the results indicate that this may prove an effective fumigant, though definite recommendations cannot be made without further work in the field.

BUZACOTT (J. H.). **Cane Pests and Diseases.**—*Queensland Agric. J.*, xxix, pt. 2, p. 114. Brisbane, 1st February 1928.

The beetle borer [*Rhabdocnemis obscura*, Boisd.] was a very severe pest of sugar-cane in northern Queensland during 1927. Although its Tachinid parasite [*Ceromasia sphenophori*, Vill.] was found in one locality where no liberations had been made, the fact that a great deal of the cane has been burnt in this district during the season greatly affects the spread of this fly. *R. obscura* was not found on red volcanic soils. The damage done in this region by cane grubs has been negligible, only a few larvae of *Anoplognathus boisduvali*, Boisd. (Christmas beetle) having been turned up by the plough in sandy soils. Minor pests were *Cirphis unipuncta*, Haw., and *Phragmatiphila truncata*, Wlk. (sugar-cane moth borer).

Mungomery (R. W.). **Cane Pests and Diseases.**—*Queensland Agric. J.*, xxix, pt. 2, pp. 115–116. Brisbane, 1st February 1928.

In many parts of the Bundaberg district (southern Queensland) the leaves of young ratoon cane were almost entirely stripped by *Cirphis loreyi*, Dup. ; a poison bait recommended elsewhere [*R.A.E.*, A, xiii, 629] has been found to be more rapid in its effects if sodium arsenite is used instead of white arsenic, dead larvae being found the day following the distribution of the bait, which should be spread lightly along the cane rows, 20 lb. being sufficient to treat an acre. Good results were also obtained by spraying the foliage with a mixture of 5 lb. lead arsenate to 100 gals. water. *C. loreyi* was heavily parasitised by two species of Tachinids and an Ichneumonid, very few completing their development. Investigations carried out in view of the preponderance of the males of *Pseudoholophylla furfuracea*, Burm. (cane beetle) attracted by light traps during the previous season [xv, 352] showed that in the field the numbers of the two sexes are approximately equal.

Jarvis (E.). **Cane Pest Combat and Control.**—*Queensland Agric. J.*, xxix, pt. 2, pp. 122–123. Brisbane, 1st February 1928.

A Coccid of the genus *Ripersia*, which is briefly described, is recorded as attacking the roots and underground buds of sugar-cane sets in the Cairns district, northern Queensland.

The flowers of *Sida retusa*, *S. acuta* and *S. cordifolia*, descriptions of which are given, are visited by the adults of the cane-grub parasites, *Campsomeris tasmaniensis*, Sauss., and *C. radula*, F., and small patches of these weeds should be left near cane fields.

Smith (J. H.). **Notes on the Blue Oat Mite** (*Notophallus bicolor* **Froggatt).**—*Queensland Agric. J.*, xxix, pt. 2, pp. 127–131. Brisbane, 1st February 1928.

Notophallus bicolor, Frogg. (blue oat mite), which is apparently recorded for the first time from Queensland, was reputed to have caused the loss of a crop of wheat in one locality and spread from a small patch over approximately 34 acres in a period of two years. Wheat attacked by this mite does not show any symptoms until it is 6 to 8 ins. in height, when the plants make very little additional growth and dry up, and the whole field gives the appearance of well-cured hay. *N. bicolor* was found swarming on self sown and wild oats but did not apparently harm them. Mites placed on a seedling plant kept in a wide-mouthed test tube fed chiefly on the upper surface of the lamina near the ligule ; a description of the type of injury caused is given. When disturbed in the field, the mites crawl or drop to the ground or in the case of the adults sometimes move to the lower surface of the leaf ; the majority remain in concealment during the hotter part of the day sheltering for the most part in the soil. Feeding apparently takes place about sunset, when the leaves are dry, the wind slight and the solar heat at a minimum ; heavy dews appear to check both the feeding and the movement of the mites, but total immersion for considerable periods does not kill them. The eggs are laid in masses on the upper surface of the leaves close to the ligule, 12 to 20 having been found in one mass in captivity. *N. bicolor* is soft bodied and can, therefore, be easily destroyed. Occasional deep ploughing to a depth of 8 to 9 ins. buries the mites at a depth from which they cannot easily emerge. The use of a skim coulter is desirable, as the upper 2 ins. of soil containing the mites and vegetation contaminated with the egg masses will be placed at the bottom of the furrow. The frequency of the operation must be determined in accordance with the requirements of the crops being grown. Frequent fallowing is also a valuable means of control, since it starves the mite, and cultivation destroys large numbers ; crop rotation is also recommended.

KELLY (R.). **The common Thrips.**— *Vict. Nat.*, xliv, no. 11, p. 316, 1 ref. Melbourne, March 1928.

Thrips imaginis, Bagn., which is indigenous, was responsible for considerable damage in gardens and orchards in Victoria in 1926. It is liable to be confused with *T. tabaci*, Lind., which does not occur in the State.

HOLDAWAY (F. G.). **The Bionomics of** *Smynthurus viridis*, **Linn., the South Australian Lucerne Flea.**—*Pamph. Council Sci. Ind. Res. Australia*, no. 4, 23 pp., 9 figs., 16 refs. Melbourne, 1927.

In South Australia *Smynthurus viridis*, L., all stages of which are described, causes considerable damage to the foliage of many winter fodder plants, particularly lucerne and clovers, and also to wheat, oats and barley when they are just appearing above the ground. A list of its numerous food-plants is given, including various vegetables. Observations on its life-history were carried out between July 1925 and September 1926. The insects appear about April just after the first winter rains and are present in the fields throughout the winter ; their numbers decrease during October, their disappearance being accelerated by the hot dry winds, so that by the middle of November they are rare and soon afterwards they cannot be found. Oviposition, under laboratory conditions, occurs about 22 to 54 days after emergence, the eggs being laid in batches of from 55 to as many as 85. Each egg is covered with a brown mud-like fluid from the anus, the source of which was found to be soil on which the female feeds between the laying of each egg. Eggs that are not completely covered are sometimes eaten by the females. The duration of the egg stage depends on the moisture in the soil, but it generally occupies from 8 to 10 days.

Experiments were conducted to find whether eggs were capable of surviving the summer. In one series the egg batches were taken from dry soil and placed in porcelain pots with sifted soil in October and November and hatched after the first rains early in May. In another experiment the eggs were kept in a hot dry room for 271 days without hatching ; distilled water was then added to the soil whenever it showed signs of drying, and the eggs hatched in from 12 to 35 days. These results show that the eggs can survive in a dry soil, but moisture is necessary for development, since hatching does not take place in, nor can the adults eat, the dry soil. Other experiments indicate that the nymphs do not develop so well in the absence of soil and that oviposition is reduced. During the first twelve hours of life the nymphs are attracted by soil more than by green food.

The weather forms the chief natural control of this pest ; predacious enemies include spiders, an unidentified Collembolan, the ant, *Pheidole ampla*, For., and a Staphylinid, *Paederus cingulatus*, Macl.

In South Australia *S. viridis* occurs over a total range of nearly 380 miles, almost all of which has an annual rainfall of 15 ins. or over. It has been found that there is a close correlation between the hydrogen-ion concentration of the soil and rainfall, the soil being more acid where the rainfall is high. An experiment made to find the effect of varying rates of pH in the soil on *S. viridis* revealed very little difference between insects placed in pots containing soil with pH values of 6·7 and 7·45, although those in the more alkaline soil were slightly smaller, but of 6 egg batches laid in the first pot, all contained more than 60 eggs with a maximum of 84 in one case, whilst in the second pot the maximum was only 34. It appears that *Smynthurus* will become active at Adelaide when the climatic conditions are such that the daily evaporation from a free water surface becomes less than 0·133 in., and hatching will cease when the evaporation becomes greater than 0·133 in.

As regards control, any farm operation that results in the destruction of the eggs on the surface of the soil during the summer or in deficiency of food for the insects in the autumn will be of considerable value. A judicious system of bare fallowing and crop rotation will probably be of major importance. The addition of lime to the soil to increase its alkalinity, apart from its effect on *Smynthurus*, is beneficial to the crop in the case of clover or lucerne. All headlands should be kept free from weeds.

DA COSTA LIMA (A.). **Relatorio sobre a doença dos cafeeiros em Pernambuco.** [Report on the Loss of Condition of Coffee Plants in Pernambuco.]—27 pp. Recife (Pernambuco), Sec. Agric., Com., Ind., Viação e Obras Publicas, 1928.

Cotton pests observed included a mite resembling *Tetranychus telarius*, L., the Coccids, *Pinnaspis minor*, Mask., and *Saissetia depressa*, Targ., *Platyedra gossypiella*, Saund., *Oxycarenus hyalinipennis*, Costa, and a Tenebrionid beetle, resembling *Alphitobius piceus*, Ol., which apparently only infests rotting bolls. *O. hyalinipennis* is believed by some to be predacious on *P. gossypiella*.

Sugar-cane pests included a moth-borer, possibly *Castnia licus*, Dru., *Diatraea saccharalis*, F., which is a serious pest, a Dynastid beetle, *Ligyrus humilis*, Burm., and a Coccid resembling *Pseudococcus boninsis*, Kuw.

The main object of these observations was to investigate a loss of condition in coffee, which is grown under more or less haphazard conditions and in which the symptoms first became serious in 1921. The Coccids, *Cerococcus parahybensis*, Hempel, *Alecanochiton marquesi*, Hempel, *Rhizoecus coffeae*, Laing (of which *R. lendea*, Pickel, is considered a synonym), and *Pseudococcus citri*, Risso, attack coffee, the last two infesting the roots. The larvae and nymphs of the males of *P. citri* produce galls on the roots in which they shelter, and this points to a special adaptation to coffee. It is possible that *P. cryptus*, Hempel, may be the final larval stage of the male of *P. citri*. *P. citri* and *R. coffeae* are more harmful to coffee than *C. parahybensis*, which infests the stem and leaves, because they precede the destruction of the roots by saprophytic fungi. *R. coffeae* is fostered and spread by an ant, *Acropyga pickeli*, Borgmeier. At the present time it is not possible to say which of all these pests is responsible for the initial stage of the loss of condition in the coffee plants ; the trouble appears to be due to factors connected with the plant itself and its environment, and it is probably intensified by various pests.

[**The Weevil Pest of Eucalyptus in Argentina and its Mymarid Parasite imported from South Africa.**]—*El Argentino*, 25th February 1928, p. 2, 3 figs. La Plata, 1928. *La Prensa*, 7th March 1928, p. 22. Buenos Aires, 1928.

The weevil attacking *Eucalyptus* is spreading in Argentina. It is considered to be *Gonipterus gibberus*, Boisd., while a second species, *G. platensis*, Mar., also occurs. Dr. Marelli reports that a batch of the Mymarid parasite of *G. scutellatus*, Gyll. [*R.A.E.*, A, xvi, 304] was imported from South Africa in December 1927 and has been maintained successfully in the laboratory.

BLANCHARD (E. E.). **Principales insectos y enfermedades que perjudican el cultivo de la yerba mate.** [Principal Insects and Diseases injurious to Maté.]—*Argentina, Minist. Agric.*, [Circ.] 735, 42 pp., 3 figs., 4 pls. Buenos Aires, February 1928.

The insects affecting maté [*Ilex paraguayensis*] are here divided according to the method of attack, with a key.

The larvae of the Lamiid, *Hedypathes betulinus*, Klug, mine the stem and branches. Severely infested plants should be uprooted and burned ; in other cases such measures as pruning off the infested parts, the injection of carbon bisulphide into the holes, which are then sealed up, the prevention of oviposition by means of a repellent, and the collection of the adults, are all of value. Another Lamiid, *Oncideres miniatus*, Thoms., rings the bark of the branches in order to oviposit. Fallen branches should be destroyed, and all ringed ones pruned off. The Coccids, *Ceroplastes grandis hempeli*, Lizer, and *Coccus hesperidum*, L., infest the branches and shoots, but may be destroyed by one of the usual contact insecticides.

The Psyllid, *Metaphalara* (*Paurocephala*) *spegazziniana*, Lizer, injures the leaves in spring, but later on the heat, drought and natural enemies, including Syrphids, reduce its numbers. Plants pruned early (June) suffer more than those pruned in August. A spray containing lime-sulphur and nicotine or sulphur should be applied after pruning. The Aphid, *Toxoptera aurantii*, Boy., can do considerable harm. The plants should be inspected frequently, especially in spring, and a nicotine spray used. The larvae of the Saturniid, *Rothschildia aurota*, Cr., abound in the summer months, from October to March ; they pupate and hibernate in a cocoon attached to the lower surface of a leaf, and the adults emerge in spring. The larvae and pupae should be collected ; an arsenical spray may be used in spring against the newly-hatched larvae, but is ineffective against the older ones. The Sphingid, *Pengonia lusca ilus*, Bsd., is the caterpillar most injurious to maté. It prefers young plants, and two or three larvae can rapidly defoliate an entire plant, causing its death. The winter is passed in the pupal stage in the ground. Arsenical sprays should be applied when the adults appear in spring in order to destroy the young larvae. The larva of the Hesperiid, *Thymele fulgurator*, Walsh, forms a tube of leaves spun together, in which it lives and pupates. These tubes should be collected, and arsenical sprays may be applied when the larvae hatch out. The Geometrid, *Microgonia apidania*, Cr., is only an occasional pest of maté ; arsenical sprays, applied when the young larvae appear, may be used if necessary. The Erycinid, *Emesis mandana*, Cr., spins the leaves together in a web and prefers shaded plants ; these nests should be collected. The Nymphalid, *Adelpha calliphiclea*, Btlr., is of negligible importance ; the larvae are found in autumn.

Formulae for the preparation of fungicide and insecticide sprays are given.

GALLWEY (A.). **The Pink Bollworm Moth. The Time of its Emergence.** —*West India Comm. Circ.*, xlii, no. 760, p. 461. London, 17th November 1927.

It is proposed to carry out investigations in Antigua to ascertain the time of emergence of the pink bollworm [*Platyedra gossypiella*, Saund.] with a view to fixing a definite planting season for cotton so that the attacks of the pest may be forestalled by early planting. For this purpose a large cage covered with mosquito netting has been constructed according to the recommendations of Professor Ballou, into which cotton seed, seed-cotton and old bolls infested with bollworm larvae are to be placed. Cotton plants grown in pots are to be introduced 2 weeks after flowering has begun, about 10 plants being introduced on the first day of each month and removed after the bolls are 4 to 5 weeks old. The bolls are to be examined and the damage done recorded ; the plants are then to be replaced by others in the same condition of flowering. It is proposed to extend these experiments over a period of 6 months. It has also been suggested that newly ginned seeds should be examined for double seeds and that these should be examined for living pink bollworms. Counts of the moths emerging from ginned cotton will also be made.

It is hoped from these investigations to determine the degree of infestation in the seed at the end of the cotton season, the natural death rate of the bollworm in stored cotton seed, and the time of emergence of the moths from infested seed over a period of 20 weeks.

Cuarantena exterior numero 7. [Mexican Foreign Quarantine No. 7.]—*Bol. mens. Defensa agríc., Sec. Agric. y Fomento, México*, i, no. 7, pp. 536–537. S. Jacinto, D.F., December 1927.

A decree dated 26th December 1927 prohibits the importation from foreign countries of banana plants or parts (stems, leaves, etc.) in order to prevent the introduction into Mexico of various diseases and pests, such as the banana borer, *Cosmopolites sordidus*, Germ.

Labor desarrollada por la Oficina Federal para la Defensa Agrícola, durante los meses de Octubre, Noviembre y Deciembre de 1927. [Work done from October to December 1927 by the Federal Bureau for Agricultural Defence, Mexico.]—*Bol. mens. Defensa agríc., Sec. Agric. y Fomento, México*, i, no. 7, pp. 543–568. S. Jacinto, D.F., December 1927.

The pests recorded in this report include the blister beetle, *Epicauta lemniscata*, F., on tomato ; and the fruit-fly [*Anastrepha ludens*, Lw.] on mango, guava, plum, mammee and sapodilla. *Diabrotica fairmairei*, Baly, and *D. balteata*, Lec., attacked water-melons. A Pentatomid, *Mormidea angustata*, Stål, has done much injury to rice in

Sonora [*R.A.E.*, A, xvi, 161], and regulations have been enacted against *Chrysomphalus aurantii*, Mask., which infests oranges in that State.

THOMPSON (W. L.). **The Seasonal and Ecological Distribution of the common Aphid Predators of Central Florida.**—*Florida Ent.*, xi, no. 4, pp. 49–52. Gainesville, Fla., February 1928.

Some of the predators here dealt with have been recently discussed [*R.A.E.*, A, xvi, 269]. Others are the Coccinellids, *Scymnus collaris*, Melsh., which is the most common predacious enemy of *Macrosiphum illinoisensis*, Shimer, and *S. terminatus*, Say, which prefers *Myzus persicae*, Sulz., though both attack other Aphids. Syrphids include *Baccha clavata*, F., which is present all the year round, but particularly in spring and summer when it usually attacks the citrus aphis [*Aphis pomi*, DeG.]; *B. lugens*, Lw., which is most common in August, and feeds chiefly on *A. pomi* and *Toxoptera aurantii*, Boy.; *Syrphus wiedemanni*, Johns., which is numerous in the autumn, winter and spring, and is commonly predacious on *A. pseudobrassicae*, Davis; and *Allograpta obliqua*, Say, most common from November to February and predacious on *A. pseudobrassicae*, *A. rumicis*, L., and other Aphids.

[WESTMORELAND (R. L.).] **Citrus Insects of Honduras.**—*Florida Ent.*, xi, no. 4, pp. 53–54. Gainesville, Fla., February 1928.

The presence of *Aphis pomi*, DeG. (*spiraecola*, Patch) is recorded in Honduras, where it is said to have been present on *Citrus* for at least ten years. The leaves of *Citrus* do not, however, become so badly curled as in Florida, and apparently there is a fungus keeping the Aphid under some measure of control. The purple scale [*Lepidosaphes beckii*, Newm.] is also a serious pest in some old groves, especially in seasons of drought.

INGRAM (J. W.). **Insects Injurious to the Rice Crop.**—*Fmrs.' Bull. U.S. Dept. Agric.*, no. 1543, 16 pp., 15 figs. Washington, D.C., December 1927.

Although no insect of major importance attacks rice in the United States, owing, probably, to the continuous submergence of the fields from about two weeks after the plants grow above the soil until they are harvested, there are a number of pests that materially diminish the crop.

The Pentatomid, *Solubea pugnax*, F. (rice stinkbug), all stages of which are described, sometimes causes a loss of 25 per cent. of the grain present in the fields, those in and around which grass is grown suffering more severely. The juice is sucked from the grain when it is in the milk stage so that false grain results, and when the dough stage is reached, portions are extracted and a chalky discoloured area left; a fungus frequently enters the punctures left by the bug. The adults hibernate in heavy grass near the surface of the soil, emerging in late April and early May and feeding on a large variety of grasses, preferably those that are making seed. Some individuals continue to breed on grass throughout the season, but others migrate to rice when it begins to form heads; there may be 4 or 5 generations a year on grass and 2 or 3 on rice. The eggs are principally laid on the upper surface of the leaves, but are sometimes found elsewhere on the plants ; from 10 to 47 eggs have been found in one cluster, one individual being known to lay 150. The egg stage lasts from 3 to 11 days, the total period from egg to adult ranging from 18 to 32 days, or even longer in cool spring weather. The adults may live as long as 47 days ; they only fly short distances when disturbed, and in the rice-fields are seldom found in large numbers far from dry land. The bugs thrive best in warm, wet weather ; in sunny weather they shelter in shady places by day and feed at night. Large numbers are found dead in their winter quarters, while nymphs are killed when exposed to the sun ; heat and cold must, therefore, be considered two of the greatest controlling factors. The eggs are destroyed by two Hymenopterous parasites, *Ooencyrtus anasae*, Ashm., and *Telenomus podisi*, Ashm., a very large percentage being attacked in the latter part of the summer. It is recommended that all grass in and around the rice-fields be kept down, while burning or ploughing the grass in the autumn or winter serves to destroy the hibernating bugs.

The larvae of *Lissorhoptrus simplex*, Say (rice water-weevil) prune off the roots of the rice plants, and the adults make slit-like scars in the leaves. The attacks of this pest have recently been so severe that plants have been killed as a result of the riddling of the leaves. It hibernates as an adult, preferably in fine matted grass, migrating to the rice-fields as soon as the rice comes up. When the fields are dry, the weevils hide during the day in the soil at the roots of the plants, but after the rice is submerged they feed by day as well as night. Oviposition occurs when the fields are submerged, the eggs being laid in the roots of the rice plant. The larvae hatch in about a week and feed on the roots ; the larval stage lasts 4 or 5 weeks and possibly longer, and the pupal stage from 5 to 14 days, the period from egg to adult ranging from 35 to 48 days. There are two generations a year, and larvae have been found on rice as late as 20th September ; the majority of the adults leave the fields when the rice begins to make heads and migrate to younger rice or grass, but both larvae and pupae have been found on headed rice. The latest date upon which *L. simplex* has been found on grass is 16th September ; it also feeds on sugar-cane. Ten species of birds attack the adults. The advisability of draining the fields for a period of about two weeks as a means of controlling the larvae is questionable, since by the time the injury becomes apparent the principal damage is already done, while the plants are putting out a new growth of roots. Many hibernating adults may be destroyed by the ploughing under or burning of leaves and grass in the autumn and winter.

Diatraea saccharalis, F., and *Chilo plejadellus*, Zinck., feed in the rice stalks in some States. The heads of the rice turn white, and 32 per cent. of the stubble in large fields has been found to be infested ; the rice stalks are greatly weakened, and the tops may break off. The damage is usually heaviest in large-stemmed varieties. Both species have two or three generations a year on rice and hibernate in the larval stage, *D. saccharalis* mostly in the crown of the plant, where moisture is available, and *C. plejadellus* in about the third joint of the stalk above the crown, where the plant is dry. Larvae of *C. plejadellus* have also been found in rice straw in the stack, and it is thought that *Diatraea* hibernates in the same manner. The adults of the latter begin to emerge in May and breed on grasses, maize and sugar-cane until the rice reaches a sufficient size to be bored ; *C.*

plejadellus does not emerge until a later date, but soon after the rice has begun to develop joints, moths of both species, which fly at night, begin to lay eggs on the leaves. The larvae hatch in 4–11 days and pupate 24–30 days later, the moths emerging in about a week. Cold weather is undoubtedly the greatest factor in the control of these borers; the eggs of both species are parasitised by *Trichogramma minutum*, Riley, and the larvae by *Microbracon* sp., but the latter is only present in small numbers. The increase of the depth of irrigation water causes many of the borers to leave their tunnels, and when they are exposed on the surface of the water, they are destroyed by minnows; both species have, however, been found feeding in rice below the water line. It is recommended that maize and related crops should not be grown near the rice-fields and that heavy grass should also be kept down, especially in the spring, while burning off the grass in the winter destroys many of the hibernating borers. Grazing the rice-fields in the autumn and winter tramples down the stubble, exposes the larvae and allows water to enter their winter quarters with the result that many are killed by the cold weather. Borers may be transported in infested rice straw.

Minor pests include *Ligyrus* (*Euetheola*) *rugiceps*, Lec. (rough-headed corn stalk beetle), which injures rice before the first irrigation and after the water has been drained off previous to harvesting. It hibernates in the adult stage, emerging in April and May to feed on sugar-cane, rice, maize and grasses, gnawing the stems between the surface of the ground and the roots. About 85 per cent. of the crop had been gnawed in one rice field observed, with a loss of about 15 per cent. from fallen stalks. The eggs are laid in the ground, and the larvae feed on decaying matter in the soil, pupating in July and August and emerging as adults after a few days. These beetles breed mainly in grass lands, especially those that are poorly drained. *L. rugiceps* may be controlled in the spring by the submergence of the attacked field, and if it appears in large numbers soon after the field is drained in preparation for harvesting, submergence should take place again and no draining be done until a few days before harvest. The ploughing of grass lands, its main breeding places, aids materially in reducing its numbers. The larvae of *Diabrotica duodecimpunctata*, F. (southern corn rootworm) attack sown rice seed and young seedlings. Rice planted after 24th April is not often seriously damaged; the larvae may be destroyed by the submergence of the fields when the rice is large enough. *Laphygma frugiperda*, S. & A., which may cause considerable damage, can also be controlled in this manner. *Blissus leucopterus*, Say, which causes heavy losses to rice in Arkansas before it is submerged may be controlled by submergence and the burning and ploughing under of dry grass, straw and other material in which hibernation takes place. Unimportant pests are an unidentified Pyralid borer, which is briefly described, and *Systena frontalis*, F., which feeds on the leaves. In California, where none of the more important pests of rice occurs, *Diabrotica soror*, Lec., has been observed in large numbers feeding on the leaves and grain, but appears to prefer rice pollen.

DUTTON (W. C.), PETTIT (R. H.) & BENNETT (C. W.). **Spraying Calendar.**—*Spec. Bull. Michigan Agric. Expt. Sta.*, no. 174, 31 pp. East Lansing, Mich., February 1928.

Instructions are given for the spraying of fruit trees, bush fruits and grapes in Michigan under average conditions. The various spray materials are discussed, and the methods of preparing the sprays are described. Spray calendars for each of the various fruits are given, with supplementary notes on some of the pests against which the sprays are directed. Brief notes on dusting are included.

GILBERT (A. H.). **Production of Potato Tuber Necrosis.**—*Science*, lxvii, no. 1740, pp. 464–465. New York, N.Y., 4th May 1928.

To investigate the relation between leaf-roll and net necrosis of the potato, plants were grown under cages in the field, both from healthy tubers and tubers infected with leaf-roll, and Aphids (*Myzus persicae*, Sulz.) were colonised on the infected plants and then transferred at intervals to the foliage of the healthy ones. Four or five such transfers were made, each involving the introduction of 25–50 Aphids into each of 5 cages. When the harvested tubers from the cages were first examined in October, necrosis, of the phloem necrosis type in early stages of development, was found in abundance in all those from the treated cages. Tubers in cages that had been kept free from all insects showed no necrosis. This experiment furnishes strong evidence that necrosis may be due to the same virus as that causing leaf-roll.

BONDE (R.). **The Transmission of Potato Blackleg by the Seed-corn Maggot in Maine.**—*Phytopathology*, xviii, no. 5, p. 459, 2 refs. Lancaster, Pa., May 1928.

In 1927 a very severe outbreak occurred in Maine of potato blackleg, which is known to be transmitted by *Phorbia* (*Hylemyia*) *cilicrura*, Rond. [*R.A.E.*, A, xiii, 176; xiv, 269], and further experiments confirming this are described.

GOSS (R. W.). **Transmission of Potato Spindle-tuber by Grasshoppers (Locustidae).**—*Phytopathology*, xviii, no. 5, pp. 445–448, 1 ref. Lancaster, Pa., May 1928.

In 1925 and 1926 tests were carried out with six species of *Melanoplus* in Nebraska to discover whether spindle-tuber disease of potatoes could be carried by insects other than Aphids, which are already known to transmit it. Grasshoppers obtained from non-solanaceous plants, not in the vicinity of potato fields, after being tested as to whether they were already carrying the virus, were placed on a caged spindle-tuber plant, and after two days transferred to a healthy plant. Double and triple inoculations were also made by transferring the same insects back to the spindle-tuber plant and again to the healthy one. With increasing numbers of grasshoppers and repeated inoculations, the percentage of infection increased, until with triple inoculations infection was obtained in 65 per cent. of the plants. The grasshoppers used were not identified until after the experiments were completed. Only a few of the tests were found to have been made with one species only, but there is no reason for supposing that any one species would be more successful than another in transmitting infection. These results account for some cases of the previously unexplained spread of the disease, particularly in the irrigated districts of western Nebraska.

Experiments with other insects from potato plants indicate that a number of them may be able to transmit this disease.

[**Insect Pests in Idaho in 1926.**]—*Bull. Idaho Agric. Expt. Sta.*, no. 142, pp. 27–29. Moscow, Ida., January 1927.

A spray containing ½ per cent. pure oil and 40 per cent. nicotine sulphate at the rate of 1 : 4265 gave complete control of *Anuraphis cardui*, L., on prunes, while the same materials were not entirely effective against *Aphis pomi*, DeG., on apples when the nicotine sulphate was used at strengths of less than 1 : 3200. Sprays containing 2 per cent. oil without nicotine were ineffective against *A. cardui*, while 7 applications of 1 per cent. oil failed to kill *A. pomi*. Pronounced injury was caused to prune foliage and fruit by any stronger applications of oil than ½ per cent.

Investigations of the beet leafhopper [*Eutettix tenella*, Baker], in relation to curly-top disease and its causes, revealed the presence of the insect in all parts of the State regardless of elevation or proximity of food-plants to sugar-beet. In some cases it is apparently only present in injurious numbers in years of dispersal, which seem to be dependent on climatic conditions. Types of beet showing some degree of resistance to the disease are being selected and bred, and the ecology of the disease and the insect is being studied, together with the possibility of forecasting outbreaks.

Against the codling moth [*Cydia pomonella*, L.], of which there was a heavy third brood in 1926, 1 per cent. oil sprays were successful as ovicides when applied at 10-day intervals, but caused injury to certain varieties of apple. Eggs laid even a week after the spray was applied hatched less freely than those on unsprayed foliage. Outbreaks of the Colorado potato beetle [*Leptinotarsa decemlineata*, Say] were effectually stamped out in 1924 [*R.A.E.*, A, xiii, 500] and 1925, beetles in infested fields being removed by hand-picking. Spraying and dusting were also carried out, and the soil was screened to detect adults and pupae in spots where the beetles were found.

Insects that may prove of economic importance found for the first time in Idaho in 1926 were: *Mineola scitulella*, Hulst, and *Eucosma* (*Spilonota*) *ocellana*, F. (bud moth), on prunes, and *Dasyneura leguminicola*, Lint. (clover seed midge), which has a somewhat wide distribution.

INGRAM (J. W.). **The Striped Blister Beetle on Soy Beans.**—*Leafl. U.S. Dept. Agric.*, no. 12, 5 pp., 3 figs. Washington, D.C., December 1927.

The adults of the striped blister beetle, *Epicauta lemniscata*, F., which attack a variety of plants, appear every year in Louisiana in fields of soy-beans [*Glycine hispida*], stripping the leaves from the plants and arresting their growth. During the winter the larvae may be found in an upright position about 4 in. below the ground surface in elevated places such as rice-field levees. In spring they become active, and they pupate in late May, the beetles emerging about 8 days later. They frequently congregate on grasses before passing to the bean field. No eggs have been found before the end of July. They are laid in a single batch of about 120 in a hole about 1½ ins. deep dug by the female beetle. Oviposition has been known to last until 14th October. The eggs hatch in about 7 days, and the young larvae scatter and feed on grasshopper eggs, this being apparently their only food. There are few natural checks to the insect; the larvae are too deep in the soil during winter to be affected by cold, though some may die if the soil becomes waterlogged. Birds and the Asilid, *Dizonias tristis*, Wlk., destroy a few of the adults. Arsenical dusts and sprays only drive the beetles away. The best remedy is sodium fluosilicate applied with a hand duster at the rate of about 15 lb. to the acre. The beetles poison themselves by removing the dust from their feet with their mouths. They begin to die about 3 hours after dusting, and within 48 hours about 99 per cent. are dead. Slight scorching of the soy-bean plants results, but the plants are hardly ever killed. If the duster has been previously used for arsenicals, it should be carefully cleaned before using sodium fluosilicate. If this insecticide is not available, the beetles may be driven by means of bunches of brush tied to sticks into piles of straw or trenches and there burnt.

Business Proceedings of the American Association of Economic Entomologists.—*J. Econ. Ent.*, xxi, no. 1, pp. 1–58. Geneva, N.Y., February 1928.

The proceedings of the fortieth annual general meeting of this Association include a report of the Committee to Formulate Plans for Investigations of the Codling Moth [*Cydia pomonella*, L.] from Biologic and Control Standpoints (pp. 31–38), with an account of the results of experiments conducted with a view to avoiding excessive spray residue, and a report of the Joint Committee on the European Corn Borer [*Pyrausta nubilalis*, Hb.] (pp. 38–42).

HARNED (R. W.). **Entomology in the Southern States.**—*J. Econ. Ent.*, xxi, no. 1, pp. 59–86. Geneva, N.Y., February 1928.

A short review is given of the development of entomology in the eleven south-eastern cotton-growing States, the relative interest in the subject being indicated by an account of the distribution of the members of the American Association of Economic Entomologists throughout North America. The entomological activities at present being carried on in the eleven States are briefly described. The relation of insects to economic and industrial life in these States is discussed, and some account is given of the achievements in insect control in this region, including the measures adopted to check the advance of the cotton boll weevil [*Anthonomus grandis*, Boh.], and the eradication of the pink bollworm [*Platyedra gossypiella*, Saund.] from Louisiana and Eastern Texas. The development of the use of various insecticides and of the aeroplane as an important adjunct in entomological work are placed to the credit of the entomologists of these States.

MCLAINE (L. S.) & CRAWFORD (H. G.). **The Status of the European Corn Borer in Canada (1927).**—*J. Econ. Ent.*, xxi, no. 1, pp. 86–89, 2 refs. Geneva, N.Y., February 1928.

The area infested by *Pyrausta nubilalis*, Hb., which continued to spread in 1927, now covers approximately 95,650 square miles, the additional territory infested amounting to 8,500 square miles in Ontario and 9,400 square miles in Quebec, and the zone extending 385 miles from north to south and 575 miles from east to west. The most westerly point of infestation was St. Joseph's Island at the north of Lake Huron, and the most easterly 50 miles east of Quebec on the

St. Lawrence river, while an outbreak was discovered 385 miles north of the original outbreak, practically at the limit of the maize-growing area. Though infestation in Quebec is still less than 1 per cent., in Ontario, with the exception of two counties where decreases occurred, there has been a general increase in infestation. In Prince Edward Island the average stalk infestation showed an increase of from 2 per cent. in 1926 to 15 per cent. in 1927. *P. nubilalis* was not found in Nova Scotia or New Brunswick. Control operations in Ontario were on the whole successful, though handicapped by wet weather in the autumn, which rendered ploughing impossible in places, and by an unusually wet spring. Further investigation is required, particularly in the direction of improved methods of ploughing or other means to reduce the necessity for hand-picking stubble and crop refuse.

WORTHLEY (L. H.). **Corn Borer Control and the Ten Million Dollar Clean-up Campaign.**—*J. Econ. Ent.*, xxi, no. 1, pp. 230–234. Geneva, N.Y., February 1928.

Details are given of the 1927 campaign against *Pyrausta nubilalis*, Hb. [*R.A.E.*, A, xv, 502]. Field work started on 21st March over 2,500,000 acres of land under maize, Government equipment being used on 170,000 acres, of which 68,000 acres were treated under compulsory regulations. Inspections, which began in June, were made over 202,338 farms, involving 2,505,005 acres of maize, 185,000 of which passed inspection and received the fee for extra labour. A total of 4,000 field and road units were used, the maximum number of employees engaged at any one time being 7,000, working over an area of 35,000 square miles. The methods employed in the campaign included stubble pulverising; clean ploughing; poling, raking and burning; machine burning; and hand-picking of stalks and débris. The co-operation given by the farmers, the State forces and the Bureaus of the Department of Agriculture is considered the best ever experienced in any large control problem.

CAFFREY (D. J.). U.S. Bur. Ent. **Corn Borer Research and the Ten Million Dollar Clean-up Campaign.**—*J. Econ. Ent.*, xxi, no. 1, pp. 89–93. Geneva, N.Y., February 1928.

The campaign against *Pyrausta nubilalis*, Hb., described in the preceding paper has provided a test on a large scale of the control methods evolved during the ten years that have elapsed since the discovery of this moth in America. The utilisation or destruction of the maize plant and its residues before the adults emerge, the only means by which the corn borer can effectively be kept in check, may be effected by feeding to livestock either direct or in the form of silage or as finely cut, ground or shredded material; by clean and sufficiently deep ploughing; or by complete burning or exposure to heat sufficient to kill larvae and pupae. Trap-crops cannot be relied upon, and other measures, such as the use of insecticides, the introduction of parasites, and varietal and seasonal planting, are still in the experimental stage. Measures hitherto widely used that have been proved definitely ineffective include disking of maize stalks or high maize stubble lands and sowing small grains without previous treatment; the use of various harrows, rollers, etc., as agents of direct kill; pasturing with livestock; and light-traps and attractants. High maize stubble has been shown to contain a dangerously large proportion of the total borers, stubble with a maximum height of more than 2 inches being unsafe without additional treatment.

It became evident in the course of the campaign that while the purely entomological information available was adequate to secure effective results, the application of mechanical processes for disposing of infested crop residues required improvement and greater skill in manipulation. An endeavour is being made to produce maize characterised by rigid stalks, which will be more resistant to corn borer attack and at the same time can be cut level with the ground without leaving residues. Field studies indicated that in certain fields the percentage of larvae in 1927 was practically double that of the preceding years, indicating that if effective control is to be maintained, no reduction can be made in the stringency of the regulations in force in 1927–28.

Larrimer (W. H.). U.S. Bur. Ent. **Results of the Ten Million Dollar Corn Borer Clean-up Campaign.**—*J. Econ. Ent.*, xxi, no. 1, pp. 93–104, 1 map. Geneva, N.Y., February 1928.

The reduction in the number of borers effected by the campaign against *Pyrausta nubilalis*, Hb., in 1927, when the infestation was restricted to about the same intensity as in 1926, amounted to an average of 98 per cent. The number of borers reported for the whole campaign area is 14 to 100 stalks as compared with 9 in 1926. Increases in infestation occurred in Michigan and Pennsylvania, while in one county in Ohio infestation was reduced. Where the thinly infested border of the infested area was thoroughly cleaned up, the natural spread, while not prevented, was retarded, a considerable spread occurring where the border infestation was not dealt with.

In the discussion that followed great emphasis was laid by C. L. Marlatt on the necessity for effecting the clean-up from the periphery of the infested area inwards, irrespective of whether infestation amounts to less than 1 per cent. in the border-line areas. The rate of spread amounts, according to past history, to from 20 to 30 miles a year, coming largely from areas having less than 1 per cent. infestation, which in Ohio have a width of more than 100 miles. Further research was advocated to determine the method of spread of the borer.

Huber (L. L.) & Neiswander (C. R.). **The Correlation between Soil Fertility and European Corn Borer Accumulation.**—*J. Econ. Ent.*, xxi, no. 1, pp. 118–120. Geneva, N.Y., February 1928.

The degree of infestation of maize by *Pyrausta nubilalis*, Hb., depends in a large measure on the stage of development attained by the plant at the period of moth flight. Four years' observations upon the relationship of soil fertility to the accumulation of the borers indicate that the rate of accumulation has been greater in western Ohio, where, on soil of limestone origin, the maize is planted earlier, grows more luxuriantly and develops more rapidly, than in eastern Ohio, where the formations consist mainly of sandstones and shales. The ratio of borers to a given unit of stalks in western compared with eastern Ohio is about 3 to 1. In one field where the maize was of generally good quality, growing on different soils, 12 per cent. infestation was found on light coloured soil, 37 per cent. on gradation soil and 86 per cent. on dark soil.

In the discussion that followed it was suggested that an odour given off by vigorously growing maize might attract the moths. J. S. Houser said that while it was a known fact that on adjacent areas of well and poorly developed maize, more eggs would be laid on the well-developed plants, the reason for this had not yet been determined. Large and vigorous plants, however, afford a larger surface on which the larvae may lodge than small and immature ones, so that where all the maize is small when the eggs are laid many more larvae fail to establish themselves than where all the plants are large.

MARCOVITCH (S.). **The relative Toxicities of Arsenicals and Fluorine Compounds to various Organisms.**—*J. Econ. Ent.*, xxi, no. 1, pp. 108–114, 2 graphs, 9 refs. Geneva, N.Y., February 1928.

Studies to determine the relative toxicities of such inorganic compounds as fluorides and arsenicals showed that while sodium fluosilicate at ·01 molar (1 : 532) produced 50 per cent. mortality in mosquito larvae within 55 minutes, sodium arsenite at the same concentration required 135 minutes, sodium arsenate 390 minutes and sodium fluoride 420 minutes. With the formula $K \frac{1}{t} \log \frac{1}{\text{conc.}}$, where t represents the velocity of fatality and K a constant expressing a numerical value of toxicity, the following values of K were obtained against mosquito larvae : sodium fluosilicate 32·1, sodium arsenite 9·6, sodium arsenate 3·5, and sodium fluoride 3. Sodium fluosilicate is thus ten times more toxic than sodium fluoride. In concentrations of 1 : 100 the fluorides of calcium, magnesium, strontium, copper, barium and lead produced 50 per cent. mortality in 84, 54, 55, 6, 3 and 1½ hours respectively. At the same concentration sodium fluosilicate required only 45 minutes. The insoluble arsenicals, calcium, arsenate, lead arsenate and Paris green killed in 11, 4 and 1¾ hours respectively. If calcium arsenate is allowed to remain in water three days before testing, it becomes as toxic as lead arsenate.

In experiments with *Melanoplus femur-rubrum*, DeG., in which definite strengths of soluble materials were added to poison baits, sodium arsenite (1 : 56) produced 89 per cent. mortality within 48 hours, whereas sodium fluosilicate gave 100 per cent. With *Feltia ducens*, Wlk., the mortality was 57 and 88 per cent. respectively in 72 hours. Baits containing sodium fluosilicate have the additional advantage of being distasteful to fowls. In connection with the possible danger of arsenical insecticides to the public health, experiments and previous observations indicate that to mammals the arsenites are 9 times more toxic than sodium fluosilicate and 30 times more toxic than sodium fluoride.

HASEMAN (L.). **Testing Commercial Insecticides.**—*J. Econ. Ent.*, xxi, no. 1, pp. 115–117. Geneva, N.Y., February 1928.

This paper emphasises the necessity for thorough testing of new materials before they are put on the market as insecticides, and recommends co-operation between State economic entomologists and the Federal Insecticide and Fungicide Board to prevent useless materials from being placed on the market.

Dozier (H. L.). **Fish Oil as an Adhesive in Control of the Grape and Codling Moths.**—*J. Econ. Ent.*, xxi, no. 1, pp. 121–125, 2 pls. Geneva, N.Y., February 1928.

In view of the damage done to apples in Delaware by the codling moth [*Cydia pomonella*, L.], which is due to the fact that the fruit is not sufficiently protected by a cover spray at the time when the larvae of the second generation are hatching, preliminary studies have been made with applications of lead arsenate with the addition as an adhesive of a choice light-pressed Menhaden fish-oil that had been used successfully for several years against the gipsy moth [*Porthetria dispar*, L.], the specification of which has been already noticed [*R.A.E.*, A, xv, 289]. Experiments with fish-oil at the rate of 1 U.S. pint to 4 lb. lead arsenate in 100 U.S. gals. water, and 1½ U.S. pints to 100 U.S. gals. combined with 2–6–50 Bordeaux mixture and with a proprietary dry lime-sulphur, showed the fish-oil to be far superior to casein-lime, 1 lb. to 100 U.S. gals., as an adhesive, residue being present on foliage and fruit 2 months after application even after periods of heavy rain. The results secured were rather better with the Bordeaux mixture than with the lime-sulphur.

Damage caused in vineyards by the newly-hatched larvae of the first spring brood of the grape berry moth [*Polychrosis viteana*, Clem.] demonstrated the necessity of including lead arsenate in the pre-blossom spray. The application of a spray consisting of 4–6–50 Bordeaux, 10 lb. lead arsenate and 1 U.S. qt. fish-oil to 100 U.S. gals., applied by the trailer method under pressure of 350 lb., protected the crop from damage by the second brood, while a total loss or further spread occurred in untreated vineyards. Fish-oil shows great possibilities for use in early pre- and after-blossom sprays in controlling *P. viteana* and in calyx and first cover sprays on late apples in the control of *C. pomonella*, though on account of its causing the lead arsenate to adhere to the fruit for such long periods, caution is given against using it in the later sprays.

In the discussion that followed C. W. Collins stated that a kill at the rate of 1,661,000 larvae to the acre was secured against gipsy moth larvae with a spray consisting of 3⅓ lb. lead arsenate to 100 U.S. gals. water, and 4 oz. fish oil to each pound of lead arsenate, applied to forest trees. An average of 63 per cent. of the poison was still on the foliage after 8 inches of rain.

Hartzell (A.) & Wilcoxon (F.). **Analyses of sprayed Apples for Lead and Arsenic.**—*J. Econ. Ent.*, xxi, no. 1, pp. 125–130, 17 refs. Geneva, N.Y., February 1928.

The following is largely taken from the authors' abstract of this paper, which includes a review of previous literature : In continuation of work on arsenical residues [*R.A.E.*, A, xv, 264], tests were made of apples grown in New York State in 1927 that had received the standard spray schedule comprising 5 applications, two before and two after the calyx spray. Each application consisted of a spray containing 4 lb. lead arsenate powder (33·1 per cent. As_2O_5), 2 lb. casein-lime and 1½ U.S. pints nicotine sulphate to 150 U.S. gals., lime-sulphur being combined with the first four. The treatment gave 96 per cent. control of the codling moth [*Cydia pomonella*, L.]. Analysis showed an average of 0·912 mg. of metallic lead per kg. of fruit and a maximum of

1·80 mg. per kg. The arsenic trioxide found in the samples averaged 0·099 mg. per kg. of fruit with a maximum of 0·193 mg. per kg., this maximum being considerably below the limit adopted by the Royal Commission on Arsenical Poisoning in London in 1903 (1·429 mg. per kg.). There were 33·24 inches of rainfall from the time the first spray was applied until the date the fruit was picked.

SULLIVAN (K. C.). **Results of Three Years' Work with Dust Sprays in Missouri.**—*J. Econ. Ent.*, xxi, no. 1, pp. 131–134. Geneva, N.Y., February 1928.

Experimental work with dusts begun in Missouri in 1925 [*R.A.E.*, A, xiv, 261 ; xv, 504] indicates that their cost is greater than that of sprays, about twice as many applications of dust being required to secure results comparable with those obtained with a liquid, owing to the shorter period that the dust remains on the foliage. Dusts of sulphur and lead arsenate gave better control of larvae of the codling moth [*Cydia pomonella*, L.] than those containing copper sulphate and lead arsenate, but dusts in general failed to control apple diseases so well as sprays.

As the result of the three years' experiments, it is concluded that dusts, though unsuitable as substitutes for sprays, may be used to supplement them, particularly for late applications, when their use would eliminate the spray residue problem and effect a considerable saving of labour.

ROARK (R. C.) & COTTON (R. T.). U.S. Bur. Ent. **Fumigation Tests with certain Aliphatic Chlorides.**—*J. Econ. Ent.*, xxi, no. 1, pp. 135–142, 18 refs. Geneva, N.Y., February 1928.

The following is taken from the authors' abstract and conclusions : Twenty-one aliphatic chlorides were tested against *Calandra* (*Sitophilus*) *oryzae*, L. (rice weevil) in flasks half filled with wheat. The more promising of these fumigants were also tried against the larvae of *Tineola biselliella*, Hum. (clothes moth), *Attagenus piceus*, Oliv. (black carpet beetle) and *Anthrenus vorax*, Csy. (furniture beetle) in a 500 ft. fumigating vault. From the standpoint of availability, cost, effectiveness and freedom from risk of fire, ethylene bichloride combined with carbon tetrachloride, the experiments with which have already been noticed [*R.A.E.*, A, xvi, 86], appears to be the most promising as a general fumigant. Tertiary butyl chloride, although more toxic, requires a larger proportion of carbon tetrachloride to render it free from fire hazard and cannot be used in metal-lined vaults owing to its tendency to break down and attack the metal. Trichloroethylene, which is non-inflammable, shows considerable toxicity (100 per cent. in 24 hours with 12 lb. to 1,000 cu. ft.) in vault fumigation at temperatures of 80° F. or over, and should prove valuable for mixing with the more toxic compounds to reduce the risk of fire. None of these materials affected the germination of wheat.

FLINT (W. P.) & FRANKENFELD (J. C.). U.S. Bur. Ent. **Preventing Insect Damage to Stored Grain.**—*J. Econ. Ent.*, xxi, no. 1, pp. 143–147. Geneva, N.Y., February 1928.

In experiments to discover the value of a number of materials in preventing insect damage to stored seed wheat, in most of which dusts were mixed directly with the wheat, which was exposed for 3 months in a room containing large quantities of grain heavily infested by the rice and grain weevils [*Calandra oryzae*, L., and *C. granaria*, L.] and the Angoumois grain moth [*Sitotroga cerealella*, Ol.], a mixture of ½ fl. oz. crude creosote to 1 lb. hydrated lime mixed with the wheat at the rate of ¼ oz. to 1 lb. wheat gave practically complete protection from insect damage without injuring the germinating qualities of the wheat. Other materials tested, which while giving good protection reduced germination of the seed, included several copper compounds, sodium and calcium fluosilicates, sodium arsenite solution, lime and various clays. Calcium fluosilicate, which proved more effective than sodium fluosilicate, while giving as good protection as the lime-creosote mixture, would poison animals if taken internally in large amounts. Copper carbonate, which is generally used in treating grain for smut, will afford a fair degree of protection against insects.

In the discussion that followed, G. A. Dean pointed out that while grain treated with creosote, lime or petroleum products is suitable for germinating purposes, it is rendered worthless for milling.

HORSFALL (J. L.). **Organic Mercury Compounds for the Control of Insects in Stored Seeds.**—*J. Econ. Ent.*, xxi, no. 1, pp. 147–150, 1 pl., 6 refs. Geneva, N.Y., February 1928.

Experiments were carried out to determine the amount of breeding of *Bruchus* (*Mylabris*) *obtectus*, Say, in peas and beans treated with various materials including Bayer dust (4 per cent. nitro-phenol mercury) ; Dipdust (2 per cent. nitro-phenol mercury, 6 per cent. chlor-phenol mercury) ; and Hoechst dust (26·5 per cent. copper salts). All dusts were approximately 90 per cent. 200 mesh fineness and were applied in dry dust form to the seeds at the rate of 2·5 oz. to the bushel, 1 part dust to 384 parts of seeds by weight. The organic mercury dusts, the copper dust and talc gave a very high degree of protection, though only the beans treated with mercury dusts showed a marked increase in germination over the check. Colloidal clay was comparatively ineffective. Bayer dust and Dipdust when mixed with uninfested maize gave protection against *Sitotroga cerealella*, Ol. (Angoumois grain moth). These organic mercury dusts are poisonous, and treated seed should not be used for food. Seed should be treated before it is placed in storage.

LEIBY (R. W.). **Cotton Boll Weevil Damage during 1927.**—*J. Econ. Ent.*, xxi, no. 1, p. 151. Geneva, N.Y., February 1928.

Estimates of damage to cotton by the boll weevil [*Anthonomus grandis*, Boh.], which in consequence of successful winter survival of weevils was unusually severe in spite of a generally favourable cotton-growing season, have been compiled for individual States in the cotton-growing area. The reduction in these States as a whole is estimated at over two million bales, of a value of over £40,000,000.

Isely (D.). **Oviposition of the Boll Weevil in Relation to Food.**—*J. Econ. Ent.*, xxi, no. 1, pp. 152–155, 1 ref. Geneva, N.Y., February 1928.

Studies carried out in 1926 and 1927 showed that while larvae of *Anthonomus grandis*, Boh. (cotton boll weevil) feed and develop either in squares or bolls of cotton, adult weevils show a preference for squares. Experiments based upon daily oviposition records of 110 mated pairs, the food of which was controlled from the date of emergence till death, indicated that not only are the longevity and period of oviposition of weevils fed upon squares greater than that of those fed exclusively on bolls, but squares and small bolls are essential for reproduction. Weevils fed exclusively on squares deposited an average of 110 eggs, the average oviposition period being 21·18 days, and the average longevity 36·27. The figures for females fed solely on small bolls were 17·7, 13·8 and 25·5. Most of the weevils fed exclusively on large bolls deposited no eggs, while the longevity period was 23·17 days. None of the weevils that were fed upon large bolls for the first ten days after emergence, and then changed to squares, began oviposition until after the change was made, 80 per cent. beginning to deposit eggs after an average interval of 3·72 days from the change of food, the number of eggs deposited being 34·9 and the oviposition period 10·3 days. Weevils fed on squares for 10 days and then changed to large bolls stopped oviposition on an average 3 days after the change of food.

In the latter part of the season if the formation of squares stops, oviposition soon ceases. The requirement of squares for reproduction limits the number of weevils that go into hibernation, and this is also a factor in the local distribution of overwintering weevils, as field observations indicate a tendency for them to migrate to fields where squares are most abundant at the end of the season.

In the discussion that followed, the author stated that as the weevil is largely a feeder on pollen in the squares, nitrogen content is probably the factor controlling oviposition and longevity.

Walker (H. W.). **The Preparation of a Special Light Sodium Fluosilicate and its Use as a Boll Weevil Poison.**—*J. Econ. Ent.*, xxi, no. 1, pp. 156–164, 4 graphs, 6 refs. Geneva, N.Y., February 1928.

The following is the author's abstract of this paper :—

Two serious objections to the use of commercial sodium fluosilicate as a poison for the boll weevil [*Anthonomus grandis*, Boh.] are its lack of covering power, due to its comparatively high apparent specific gravity, and its toxicity to plants. These have been overcome by incorporating from 10 to 20 per cent. colloidal silica with sodium fluosilicate during the commercial process of manufacture.

The resulting special light sodium fluosilicate, containing at least 80 per cent. Na_2SiF_6, causes no economic plant injury and is a quicker weevil killer than commercial calcium arsenate. Under certain field conditions, however, it does not adhere to the plant so well as calcium arsenate. This lack of adherence under extremely moist conditions can probably be overcome by the incorporation of a small amount of adhesive during the process of manufacture.

Barium fluosilicate, similarly prepared, is about as effective as the sodium salt.

Walker (H. W.). **The Preparation of special Calcium Arsenates containing less than 40 per cent. Arsenic as AS_2O_5 and their Use as Boll Weevil Poisons.**—*J. Econ. Ent.*, xxi, no. 1, pp. 165–173, 4 graphs, 2 refs. Geneva, N.Y., February 1928.

The following is the author's abstract of this paper :—

A special calcium arsenate containing only about 20 per cent. arsenic calculated as As_2O_5 was found to be equally as effective as a control for the boll weevil [*Anthonomus grandis*, Boh.] as commercial calcium arsenate in extended cage and field tests. The material caused no plant injury.

This special calcium arsenate was prepared by heating precipitated chalk and white arsenic (As_2O_3) in the presence of excess air at a temperature of 650° C. [1202° F.] for about an hour. In this manner it was possible to prepare a calcium arsenate containing any desired percentage of arsenic as As_2O_5 up to 57·6 per cent., the theoretical for normal calcium arsenate, $Ca_3(AsO_4)_2$. The conversion from the trivalent to the pentavalent state is practically complete, and there is scarcely any free lime formed under these conditions. Any arsenic lost in this process is recoverable on a commercial scale.

The particles of the special calcium arsenate containing 20 per cent. arsenic as As_2O_5 consisted of an inert core of calcium carbonate covered with a coating of substantially 100 per cent. normal calcium arsenate.

This direct oxidation method of preparation is adaptable for arsenates other than calcium.

Snapp (O. I.). U.S. Bur. Ent. **A Preliminary Report of the Toxic Value of Fluosilicates and Arsenicals as tested on the Plum Curculio.**—*J. Econ. Ent.*, xxi, no. 1, pp. 175–178, 1 ref. Geneva, N.Y., February 1928.

In order to observe their comparative effectiveness against *Conotrachelus nenuphar*, Hbst. (plum curculio), experiments were carried out with a number of insecticides on peach. Sodium fluosilicate without lime, both as dust and at the rate of 2 lb. to 50 U.S. gals. water, was the most toxic to *C. nenuphar*, but was also highly injurious to peach foliage and fruit. While the addition of lime corrected the scorching effect of sodium fluosilicate, it also largely destroyed its toxicity to the weevil. Lead arsenate with lime, either as dust or spray, was found to be more toxic than any of the insecticides tested except sodium fluosilicate without lime. The other insecticides in order of toxicity, were barium arsenate, tricalcium arsenate, zinc arsenate, magnesium arsenate, manganese arsenate, aluminium arsenate, sodium arsenate, sodium fluosilicate with lime, calcium fluosilicate compound (16 per cent. calcium fluosilicate) and scorodite, a natural ferrous arsenate found to be practically worthless as an insecticide for *C. nenuphar*.

Howard (N. F.). U.S. Bur. Ent. **Some Notes on the Mexican Bean Beetle Problem.**—*J. Econ. Ent.*, xxi, no. 1, pp. 178–182, 1 map. Geneva, N.Y., February 1928.

The Mexican bean beetle [*Epilachna corrupta*, Muls.] after two years of very slight migration, spread 150 miles to the northeast of its former limit in 1927 and reached a point in the province of Ontario, Canada, as well as extending its radius in the important bean-producing States of Michigan and New York. It also spread eastward in the Altantic seaboard States from South Carolina to Pennsylvania. This extension of distribution, together with the damage occurring in previously infested areas, has constituted 1927 the year of the greatest injury yet caused by *E. corrupta*, which now ranks as an important pest.

An account is given of the various insecticides tried during the past 3 years for the control of the beetle, most of which have been already noticed [*R.A.E.*, A, xiv, 262, 272; xv, 401]. Analyses of sprayed beans indicate that there is no danger in the use of magnesium or calcium arsenate, which with the addition of lime have proved superior to sodium fluosilicate in combating the beetle, when applied as recommended. Pyrethrum and pyrethrum extracts have been used extensively and are very toxic to both adults and larvae. Poor results were secured, however, in the case of a heavy infestation, when 5 applications were made a week apart, probably owing to the absence of toxic residue. As pyrethrum can be used after the bean blossoms, it is of value for those who refuse to use arsenicals on green beans. In the north, where only two broods, or two and a partial third, of *E. corrupta* occur, considerable injury can be avoided by late planting to escape the overwintered females.

The Tachinid, *Paradexodes epilachnae*, Ald., a parasite of *E. corrupta* in Mexico, is of great potential value, and further efforts to introduce it are recommended.

DeLong (D. M.). U.S. Bur. Ent. **Some Observations upon the Biology and Control of the Potato Leafhopper** (*Empoasca fabae*, **Harris**).—*J. Econ. Ent.*, xxi, no. 1, pp. 183–188. Geneva, N.Y., February 1928.

Empoasca fabae, Harr. (potato leafhopper) has been observed to pass its life-cycle under natural conditions on a number of wild and cultivated plants including the common dock, bean, potato, egg-plant, rhubarb, lucerne, clover and apple, as well as several ornamental plants, the type of injury varying according to the plant. The earliest cultivated food-plant favoured in Ohio appears to be the bush-bean, on which the leafhoppers were found in abundance in 1927 as early as 20th May, when oviposition began at once. The adults migrate to potato about a month later.

Life-history studies in 1926 and 1927 showed four distinct broods during the season, the generations overlapping considerably. In 1927 the first eggs were laid in the field on 25th May, and eggs were still hatching on 1st November. Adults and nymphs of the second, third and fourth instars were still present on rhubarb in the field on 1st December after a minimum temperature of 25° F. had occurred. The average pre-oviposition period for 90 pairs in two seasons was rather over 6 days, whereas previous records show pre-oviposition periods of 20–30 days. The incubation period, which varied considerably, showed an average of 9·9 days, but was less than 9 days in June, July and August. The average number of days from hatching to the adult stage was rather more than 12 for the first and second broods, 14·4 for the third and 22 for the fourth in 1926. The average longevity under cage conditions was 30–40 days, but one female was observed to live 91 days and produce 216 fertile eggs. Mating is apparently necessary for the production of fertile eggs, but one mating is sufficient for the life of a normal female. There is a wide variation in the number of eggs deposited by individuals, but the majority show an average of 2–3 eggs a day.

Control on beans was most easily accomplished by an oleoresin of pyrethrum extract [*R.A.E.*, A, xiv, 656], which may be used at dilutions as high as 1 : 300. Though highly toxic to the nymphs, this material is apparently not of value as an ovicide. The most satisfactory results obtained from dust were secured with a 40 to 50 per cent. calcium cyanide, and no injury to the plants was noticed.

In the discussion that followed, A. Hartzell stated that recent experiments indicate that the length of time taken to complete a generation varies greatly according to temperature. At a constant temperature of 78° F. and a relative humidity of 80 per cent., the period from egg to adult may be reduced to 18 days.

MORGAN (A. C.) & LYON (S. C.). **Notes on Amyl Salicylate as an Attrahent to the Tobacco Hornworm Moth.**—*J. Econ. Ent.*, xxi, no. 1, pp. 189–191. Geneva, N.Y., February 1928.

Tests of a number of chemicals carried out to discover an artificial substitute for the odorous principle of the Jimson weed [*Datura stramonium*], the flowers of which are very attractive to *Protoparce* (*Phlegethontius*) *carolina*, L. (tobacco hornworm) showed that amyl salicylate incites a decided feeding response in the moths, which were more attracted to artificial flowers touched with the chemical than to adjacent natural blossoms. Large numbers of tobacco moths and 16 other species of Sphingids were caught in experiments made in 1926 with a number of different types of cage traps, in baiting which strips of black cloth were used to avoid possible reaction of the moths to colour. The cloths were greased with benzoated lard in order that the odour should be slowly released, and small funnels painted white were used to simulate Jimson weed blossoms. Six traps in a 16-acre field caught 2,194 moths, including sufficient newly emerged females to have deposited 8·5 eggs to the plant under normal conditions, infestation in the trapped field amounting to 2·63 eggs and larvae to each plant as compared with 6·67 in the check fields. In a repetition of this experiment when 8 traps were used to 8 acres, the odour was distributed from a lamp wick immersed in a vial of amyl salicylate and the white funnels were omitted. Infestation of the trapped fields from 29th July to 1st September averaged 4·1 eggs and larvae to a plant while the control averaged 6·3, the number of female moths caught being sufficient to have deposited 8·1 eggs to each plant. Various species of Sphingids were caught in the traps, but the only non-tobacco feeding species taken in numbers were *Xylophanes tersa*, L., and *Deilephila* (*Celerio*) *lineata*, F.

In preliminary field experiments it appeared that amyl benzoate is likely to prove even more attractive to *P. carolina* than amyl salicylate.

HASEMAN (L.). **Tarnished Plant Bug Injury to Strawberries.**—*J. Econ. Ent.*, xxi, no. 1, pp. 191–193. Geneva, N.Y., February 1928.

Lygus pratensis, L. (tarnished plant bug) caused severe damage to the late crop of blossoms and developing strawberries in several fields in south-west Missouri, following a severe frost in the spring of 1927, the entire crop being lost in some cases. The blossoms attracted the ovipositing adults, and the injury was caused before 10th May by the first brood of nymphs (injury caused by *L. pratensis* is usually due to feeding by adults), and was confined to the berries, the growth of which was stopped, the texture being rendered dead and woody.

Control measures recommended include the cutting of flowering weeds likely to serve as food-plants, such as *Erigeron canadensis*, during the summer and autumn, and the destruction of possible hibernation quarters. A method of mulching should be employed that does not afford protection to the bug during the winter. If adults appear on the plants in the spring, they can be driven with the wind when the mulch is drawn away from the rows. The young nymphs may be destroyed by applications of nicotine spray or dust.

HINDS (W. E.) & SPENCER (H.). **Insecticidal Control for the Sugarcane Borer.**—*J. Econ. Ent.*, xxi, no. 1, pp. 193–198. Geneva, N.Y., February 1928.

The greater part of the information contained in this paper on the results secured from 1925 to 1927 in work against the sugar-cane borer [*Diatraea crambidoides*, Grote] in Louisiana has already been noticed [*R.A.E.*, A, xv, 440; xvi, 237]. Among more than 50 samples of proprietary silicofluoride (fluosilicate) materials tested against the borer in 1927, several of the new mixtures killed from 40 to 50 per cent. of all larval stages. These applications, which were made in August and September, do not appear to affect unfavourably the work of *Trichogramma minutum*, Riley, which in 1927 was most effective from June to November, nearly 98 per cent. of the borer eggs being parasitised by 20th September.

HOLLISTER (W. O.) & JACOBS (H. L.). **Injection Experiments for controlling Insects.**—*J. Econ. Ent.*, xxi, no. 1, pp. 198–201. Geneva, N.Y., February 1928.

In the continuation of previous experiments [*R.A.E.*, A, xv, 283], injections of aloes, aloin, thymol and acid fuchsin were made in trees against the bronze birch borer [*Agrilus anxius*, Gory] with negative results so far as the borer was concerned, although the materials travelled in some cases rapidly in the trees, colouring the wood and leaves, which subsequently died.

O'KANE (W. C.). **A Power-driven Grasshopper Catcher.**—*J. Econ. Ent.*, xxi, no. 1, pp. 201–202. Geneva, N.Y., February 1928.

A method of catching grasshoppers has been devised in New Hampshire where an outbreak occurred in 1927, the species concerned being *Melanoplus femur-rubrum*, DeG., and *M. bivittatus*, Scud.

The following is the author's abstract: A frame 14 ft. long and 2 ft. high, carrying a burlap bag of the same length and height, and 4 ft. deep, was suspended in front of a Ford chassis so that the lower edge of the frame touched the ground. Driven across the fields the bag caught small grasshoppers by the bushel and stopped a serious infestation.

Douglass (J. R.). U.S. Bur. Ent. **Precipitation as a Factor in the Emergence of** *Epilachna corrupta* **from Hibernation.**—*J. Econ. Ent.*, xxi, no. 1, pp. 203–213, 1 ref. Geneva, N.Y., February 1928.

Studies of the emergence of *Epilachna corrupta*, Muls. (Mexican bean beetle) during the years 1924–26 from artificial hibernation in cages at various altitudes and from natural hibernation, indicate a definite relation between precipitation and the emergence of the beetle and show that the percentage of emergence is influenced directly by the temperature prevailing during the period of rainfall. It appears that a combination of both factors is necessary to stimulate emergence, rain exercising the greater influence of the two. The fact that no beetles emerged on some of the hottest days of the season indicates that heat alone is inadequate to produce emergence. A few beetles may, however, emerge on warm days without the aid of rain, provided that the hibernation material is damp. Emergence rarely occurs when the temperature is below 55° F. and attains its maximum at a mean temperature of 58° F. to 69° F. Precipitations of hail, which reduced the temperature from 64° F. to 50·5° F., and from 83° F. to 54° F., failed to stimulate emergence. Emergence increased in response to experiments in artificial precipitation.

Hefley (H. M.). **Differential Effects of Constant Humidities on** *Protoparce quinquemaculatus*, **Haworth, and its Parasite,** *Winthemia quadripustulata*, **Fabricius.**—*J. Econ. Ent.*, xxi, no. 1, pp. 213–221, 2 graphs, 21 refs. Geneva, N.Y., February 1928.

The author considers that the importance of humidity as a factor in the metamorphosis of insects has been much underrated and reviews the literature dealing with this subject.

Experiments in which larvae of *Protoparce quinquemaculata*, Haw. (tomato moth), both unparasitised and parasitised by the Tachinid, *Winthemia quadripustulata*, F., were subjected to different constant humidity percentages at a constant temperature during the pupal period, indicated that atmospheric humidity has a definite effect on the rate of metabolism of both insects. At 27° C. [80·6° F.] the duration of the pupal period of *P. quinquemaculata* is nearly constant from 0 per cent. to 73·4 per cent. humidity, above which it increases up to 100 per cent., while that of *W. quadripustulata* is greatest at 7·1 per cent. and decreases up to 73·4 per cent., at which percentage both host and parasite show a maximum rate of metamorphosis. The absence of a definite optimum in the case of the host is due to its greater resistance to desiccation at low humidities. The viability of the host at 27° C. is, however, greatest at 0 per cent., the mortality occurring at higher humidities being due to attacks of fungous and bacterial diseases, none of which will develop below a humidity of 7·1 per cent. at 27° C. The viability of the parasite, on the other hand, owing to the low resistance of the puparia to desiccation at low humidities and their freedom from disease at high humidities, is greatest at a humidity of 73·4 per cent. One of the broods of the moth goes into hibernation and survives the winter, but the parasite has no definite hibernation requirement, the winter brood developing in the same time as the summer broods at a temperature of 27° C. The shortest pupation period of the winter brood of *P. quinquemaculata* at 27° C. was 120 days, or nearly 5 times the length of the normal summer brood.

Newcomer (E. J.). [**Increase of the Codling Moth Parasite,** *Ascogaster carpocapsae*, **in the Vicinity of Yakima.**]—*J. Econ. Ent.*, xxi, no. 1, p. 221. Geneva, N.Y., February 1928.

As compared with a parasitism of 22 per cent. in 1926, 7,700 or 31 per cent. of the larvae of the codling moth [*Cydia pomonella*, L.] taken during the season of 1927 from bands on unsprayed trees about 1 mile north-east of the original point of introduction of the parasite in Washington, were found to be parasitised by *Ascogaster carpocapsae*, Vier. Of this total, batches of about 1,300 each have been sent for distribution in other parts of Washington and to British Colombia.

Shotwell (R. L.) & Cowan (F. T.). U.S. Bur. Ent. **Some Preliminary Notes on the Use of Sodium Arsenite Dust and Spray in the Control of the Mormon Cricket** (*Anabrus simplex*, **Halde.**) **and the Lesser Migratory Grasshopper** (*Melanoplus atlantis*, **Riley**).—*J. Econ. Ent.*, xxi, no. 1, pp. 222–230, 4 refs. Geneva, N.Y., February 1928.

In order to discover a poison the use of which involves less expenditure of time, labour and material than that of bran mash against *Melanoplus atlantis*, Riley (lesser migratory grasshopper) and *Anabrus simplex*, Hald. (Mormon cricket) in Montana, preliminary experiments were carried out in the summer of 1926 with sodium arsenite dusts and sprays, which have been successfully used against grasshoppers in other parts of the world [*R.A.E.*, A, xi, 251; xv, 1]. When possible, the dusts were allowed to drift over the swarm with the wind.

Experiments against third and fourth instar nymphs of *A. simplex* with sodium arsenite sprays gave 70 to 90 per cent. kills at a strength of 1 : 16 (8 oz. liquid sodium arsenite to 1 U.S. gal. water). The liquid sodium arsenite contained 8 lb. arsenic to 1 U.S. gal. Sprays at greater dilutions than 1 : 32, which gave 60–70 per cent. mortality, only secured slight kills, but it is believed that weaker solutions will give good results against the first and second instars. Severe scorching resulted on lucerne, especially from the 1 : 16 spray, from which the plants never recovered. No damage occurs, however, when the sprays are applied to crickets in spring on the hatching grounds, as the soil there is mainly bare and the vegetation of little commercial value, the eggs not being laid on cultivated fields. Good results were secured against adults with a sodium arsenite dust, which has not yet been tried against the nymphs, kills being secured up to and including 20 ft. from the point of application.

Though more rapid mortality was secured with the stronger solutions in experiments with sprays against *M. atlantis*, the percentages of the total kill, which varied from 98 to 100 per cent., were the same for all solutions, including 1 : 128. Spraying with a 1 : 64 solution at the rate of 16 U.S. gals. to the acre when grasshoppers, mostly fifth instar nymphs, were congregated for shelter on a dense growth of thistles, killed all nymphs at the end of the third day after application. Spraying was found to be effective in stopping migration, and a spray barrier proved effective not only against individuals already within it, but also against those that moved into it. Scorching would, however, be a serious obstacle to the use of the spray in cultivated crops. Experiments with sodium arsenite dust applied with an ordinary hand duster, indicate that good kills can be obtained at relatively long distances, 100 per cent. mortality being secured at 100 ft. in the case of adults and at 40 ft. in the case of fifth instar nymphs. Good kills would doubtless be obtained at greater distances with a larger duster capable of expelling greater amounts of powder. Dust is also effective as a barrier, destroying practically all grasshoppers within the treated area and also those moving into it some time after the application has been made.

Ballou (C. H.). **An Observation on Mating Habits of** *Leptinotarsa undecimlineata*.—*J. Econ. Ent.*, xxi, no. 1, pp. 235–236. Geneva, N.Y., February 1928.

Leptinotarsa undecimlineata, Stål, is commonly found feeding on *Solanum torvum* in the West Indies and other Caribbean countries, where the fruits of this shrub are sometimes used for culinary purposes. The mating and oviposition habits of this beetle are briefly described.

Rosenfeld (A. H.). **Moth Borer Damage to different Varieties of Sugar Cane.**—*J. Econ. Ent.*, xxi, no. 1, p. 236. Geneva, N.Y., February 1928.

The author questions the accuracy of the theory advanced by Holloway and Haley that a reduction in the hibernating larvae of the sugar-cane borer [*Diatraea saccharalis*, F.] in Argentina had been caused by the introduction of long stubbling varieties of sugar-cane from Java [*R.A.E.*, A, xvi, 122]. This theory is based on the supposition that the old varieties produced only one or two stubble (ratoon) crops, whereas at one time eight and ten were not uncommon, and the average at the time of replacement was four or five. While it is true that the new canes give promise of producing several more stubble crops than the old, it is noticeable that during the years 1917–20, when the entire cane area was being laid down to new varieties, a subsidence in moth borer injury coincided with the harvesting of larger proportions of plant cane than in any similar period before or since. Although little cane has been planted in Tucumán since 1924 and the last two crops have been almost entirely stubble cane, borer damage has been on the increase during the last two years.

Box (H. E.). **La** *Diatraea saccharalis* **y las variedades de caña "P.O.J."—Algunas observaciones y criticas.** [*D. saccharalis* and the P.O.J. Canes. Some Observations and Criticisms.]—*Rev. ind. y agríc. Tucumán*, xviii, no. 7–8, pp. 108–115, 5 refs. Buenos Aires, 1928. Translated in *The Planter & Sugar Manuf.*, New Orleans, La., 3rd March 1928, reprint 4 pp.

Owing primarily to the effects of the mosaic disease, the so-called "native" (Cheribon) types of sugar-cane have been replaced in Tucumán (Argentina) and Louisiana by the P.O.J. varieties from Java, which have characteristic tolerance to mosaic. The author disagrees with the theory of Holloway and Haley on the resistance of these varieties to *Diatraea saccharalis*, L., for the same reasons as those given in the preceding paper, and explains the temporary decrease in infestation by this moth in Tucumán as being due primarily to the abnormally severe winters at the time when the change took place. Evidence for this is given in some detail. P.O.J.36 appears to possess a decided "resistance" to *D. saccharalis*, while P.O.J.213 and P.O.J.2725 approach more to the "native" cane, showing that no class comparison can be made.

LIST (G. M.) & YETTER, Jr. (W. P.). **The Codling Moth in the Grand Valley of Colorado.**—*Bull. Colo. Agric. Expt. Sta.*, no. 322, 46 pp., 5 figs. Fort Collins, Colo., May 1927.

There are few fruit-growing areas in the United States where the problem of dealing with the codling moth [*Cydia pomonella*, L.] is so serious as in the Grand Valley of Colorado. In an orchard receiving attention that would ensure a good measure of control in other places, 100 apples picked at random showed a total of 606 eggs. A prolonged study of the insect and the possibilities of its control in that region have therefore been undertaken, the earlier years having been already reported upon [*R.A.E.*, A, x, 186, 275]. The life-history and seasonal history are given in detail up to the year 1926, showing two complete generations and a partial third each year. Dusting gave poor results; spraying with lead arsenate proved by far the most effective single method of control. The value of spreaders is not considered to be conclusively proved; the most promising are fish-oil soap, linseed-oil soap and casein-lime, the last being the most convenient and economical. Seven or eight sprays should be the maximum, the calyx application being the most effective single one. It is impracticable to reduce spraying to a point where the spray residue will not be objectionable. Baits, particularly fermenting apple juice, have proved very promising; these, placed in glass fruit jars, are hung in the upper third of the trees. Oil sprays can be successfully used as ovicides but are generally more or less injurious to the tree. Some of the summer oil emulsions made from highly refined oils have been the least objectionable, but these are as yet only in the experimental stage with regard to codling moth control and should be used only to a limited extent, particularly as the injury they cause is not always apparent immediately after application. The high temperatures reached at times in the Grand Valley tend to produce more serious injury than in some other regions. The same treatment against *C. pomonella* should be carried out on pears. There are also indications that this moth is becoming a pest on soft fruits; it has occasionally caused serious injury to plums, prunes and apricots and may attack cherry and peach.

WAKELAND (C.). **The Snowy Tree Cricket, its Injury to Prune and Methods of combating it.**—*Bull. Idaho Agric. Expt. Sta.*, no. 155, 29 pp., 4 pls. Moscow, Idaho, July 1927.

This is a more detailed account of the bionomics and control of *Oecanthus niveus*, DeG. (snowy tree cricket), which is a serious pest of prunes in Idaho, than that already noticed [*R.A.E.*, A, xiv, 448]. The characters distinguishing *O. niveus* and *O. quadripunctatus*, Beut., both of which oviposit in prune trees and feed on the fruit and foliage, are indicated. While the eggs of *O. niveus* are deposited singly in the bark of large limbs and rarely penetrate the pith of the smaller twigs, those of *O. quadripunctatus* are laid in series in small twigs, chiefly in the growth of the previous season, and the egg punctures extend through the bark to the central pith.

HAEGELE (R. W.). **The Beet Leaf-hopper** (*Eutettix tenella*, **Baker**). **A Survey in Idaho.**—*Bull. Idaho Agric. Expt. Sta.*, no. 156, 28 pp., 13 figs., 3 refs. Moscow, Idaho, July 1927.

This paper discusses the results of a survey carried out in Idaho in 1925 and 1926 of *Eutettix tenella*, Baker (beet leafhopper) and gives details of its local distribution. A list is given of 42 plants from which the leafhopper was collected, belonging to 11 families. Those most widespread and constituting the principal alternative food-plants over the largest areas were *Sisymbrium altissimum* (tumbling mustard), *Sophia filipes* (green tansy mustard), *Salsola pestifer* (Russian thistle) and *Atriplex rosea* (redscale), while *Bassia hirsuta* was very important in certain areas. The only cultivated plants other than beets and mangels on which the leafhopper was found were turnips, potato, beans and lettuce.

GRISWOLD (G. H.). **The Control of Aphids on House Plants.**—*Cornell Extens. Bull.*, no. 162, 15 pp., 8 figs. Ithaca, N.Y., December 1927.

This bulletin suggests simple remedies for the Aphids commonly attacking plants grown in houses, to which very little attention has been given. Owing to the even temperature in dwellings, the Aphids can reproduce regularly throughout the year; *Macrosiphum cornelli*, Patch (geranium aphis) for example, requires 10 or 12 days for a generation, producing an average of 30 to 35 young to each female. Probably the commonest species is *Myzus persicae*, Sulz., which produces no sexual forms indoors and lays no winter eggs. This species, *Aphis gossypii*, Glov., which also reproduces asexually, and *Myzus circumflexus*, Buckt. (lily aphis) are general feeders, attacking a variety of flowering plants. *M. cornelli* confines its attacks to various species of *Pelargonium* (geranium), but has not been observed on the commonest species (*P. hortorum*). *Idiopterus nephrolepidis*, Davis (black fern aphis) is confined to ferns; *Macrosiphum pseudodirhodum*, Patch, and *Capitophorus* (*Francoa*) *rosarum*, Kalt., occur on roses, and *Cerataphis lataniae*, Boisd. (palm aphis) has been found on orchids in greenhouses.

Fumigation has proved impracticable, owing to the difficulty of computing the correct amount of fumigant for use under a small receptacle such as a pail. Hot water dipping cannot be recommended, owing to the narrow margin of safety between temperature necessary to kill the Aphids and injury to the plant. A solution of ¼ teaspoonful nicotine sulphate and ¼ oz. soap to 1 U.S. qt. water has proved very successful for dipping the plants or as a spray. After treatment the plants should be placed on their sides to drain, and on the following day they should be dipped in clear water or sprayed with it to wash off the insecticide. The simplest remedy, however, is a 2 per cent. free nicotine dust, which is equally effective against the several species of Aphids against which it has been tested and which kills 90 to 100 per cent. within a short time. The plants before treatment should be covered with a cloth thrown over small stakes driven into the soil, the hand-duster being inserted under the cloth so that the dust will reach the lower surface of the leaves. The cloth may be removed in 10 or 15 minutes when the dust will all have settled on the plants. A list of the Aphids found on house plants in Ithaca, New York, with their respective food-plants is appended.

Destructive Insect and Pest Act. Regulation no. 1 (Foreign) 2nd Revision.—*Canada Dept. Agric.*, A.O.R. suppmt. no. 8, 6 pp. Ottawa, Ont., 12th April 1928.

This 2nd Revision, governing the admission of nursery stock into Canada, revises a previous one [*R.A.E.*, A, xii, 414] and comes into force 1st September 1928. Permits are necessary to import nursery stock from any country, and shipments must be accompanied by a certificate of inspection from the country of origin, containers being suitably marked. Importation must be through specified towns. If any nursery stock is found infested with any pest or disease, it is treated or destroyed at the importer's expense.

A list is appended of plants from various countries, the introduction of which is prohibited or restricted, with a reference to the Regulation applying to them.

Instrucciones para combatir el barrenillo del chile (*Anthonomus eugenii*). [Instructions for combating the Chillie Borer Weevil.]—*Bol. Oficina Defensa agríc., México*, no. 4, 7 pp., 3 figs. S. Jacinto, D.F., November 1927.

The weevil, *Anthonomus eugenii*, Cano, oviposits in the blossoms of chillie peppers [*Capsicum*], and the larvae bore into the buds and fruits causing many of the latter to fall. They pupate within the fruits, from which the adults bore their way out. Indirect methods of control are the use of uninfested seed or seed soaked for ten minutes in a 0·3 per mille solution of formalin (commercial 40 per cent.) ; early sowing (in seed-beds from which the seedlings are transferred later) so as to avoid attack ; clean cultivation ; the daily collection of all fallen chillies and their immediate destruction by burning ; jarring the plants to cause the fall of the infested blossoms, young fruits and weevils, all this material being burned ; and crop rotation.

If necessary the plants can be protected by tents. Experiments are to be made with various insecticides.

DE TOLEDO PIZA, Jr. (S.). **Estragos causados pela broca do café.** [The Losses caused by the Coffee Borer.]—*Rev. Soc. rur. brasileira*, viii, no. 94, pp. 84–85. S. Paulo, March 1928.

This is a popular article on the geographical distribution and methods of spread of the Scolytid, *Stephanoderes hampei*, Ferr., in the State of S. Paulo.

HALL (W. J.). **Report on Citrus Pests.**—5 pp. typescript. Citrus Estate, Mazoe [Rhodesia], 6th January 1928.

The most important pests recorded on *Citrus* on three estates in Rhodesia are *Chrysomphalus aurantii*, Mask. (red scale), *Coccus* (*Lecanium*) *hesperidum*, L. (soft scale), *Aphis tavaresi*, Del Guer., and an undetermined thrips, while less important ones are *Heliothis obsoleta*, F., *Argyroploce leucotreta*, Meyr., two species of fruit-fly, fruit-piercing moths, the Coccids, *Pseudococcus filamentosus*, Ckll., *P. citri*, Risso, *Icerya purchasi*, Mask., and *Chrysomphalus ficus*, Ashm. (*aonidum*, auct.), *Papilio demodocus*, Esp. (*demoleus*, auct.), the citrus psylla [*Trioza merwei*, Pettey] and an undetermined species of *Ceroplastes*.

Entomological Notes no. 38.—*Fmg. S. Afr.*, reprint, 2 pp. Pretoria, January 1928.

Eumolpid beetles of the genus *Colasposoma*, which generally live on wild trees and shrubs, have been recorded during November as attacking *Citrus* in the absence of their usual food-plants. Hand collection of the beetles, which is facilitated by shaking them on to canvas spread under the trees, is recommended, as arsenicals cannot be used owing to their effect on the fruit. The cluster bug, *Agonoscelis versicolor*, F., invaded farm dwellings in the Transvaal in enormous numbers, and was also abundant on *Eucalyptus*, peach and *Acacia*. Green peaches became deformed, having been badly punctured while still small. The giant cricket, *Brachytrypes membranaceus*, Drury, is troublesome, particularly in the sandy soil of the Transvaal; the crickets emerge from their underground nests at night and cut off young plants, which they drag into their burrows. The nests, which are easily recognised by mounds of loose earth, can be destroyed by inserting a teaspoonful of calcium cyanide into the entrance. Where water is abundant, drowning the insects is an effective measure of control.

THEOBALD (F. V.). **Two Chrysanthemum Aphids new to Great Britain.**—*Entomologist*, lxi, no. 778, pp. 49–51, 2 figs. London, March 1928.

Rhopalosiphum (*Stephensonia*) *lahorensis*, Das, the alate and apterous viviparous females of which are described, and *Capitophorus chrysanthemi*, Theo., are recorded on chrysanthemums for the first time in Britain. These Aphids were accompanied by *Macrosiphum* (*Macrosiphoniella*) *sanborni*, Gill., and *M. lineatum*, van der Goot.

BRITON-JONES (H. R.) & STANILAND (L. N.). **The Effects of Strawberry Aphis** (*Capitophorus fragariae*, **Theobald**) **on the Strawberry Plant.**—*J. Pom. Hortic. Sci.*, vi, no. 2, pp. 128–136, 5 pls., 12 refs. London, June 1927.

Potted plants of different varieties of strawberry, the leaves of which were crinkled, split, stunted or discoloured, were observed, when brought under greenhouse conditions in Bristol in 1925, to be infested with *Capitophorus fragariae*, Theo. In a subsequent experiment, plants infested by the Aphid developed characteristic damage, the effects of which are discussed, as soon as the infestation had become heavy, while uninfested plants remained normal. Although the attacked plants produce abundant flower trusses earlier than the normally growing plants, the fruits, though more numerous, are small, mis-shapen and of little market value. Aphids may be present on normal and fully developed leaves, but only cause observable damage when they attack the foliage in a very young and tender state. The amount of the damage depends on the growth of the plant, the rate of reproduction of the Aphid and the number present at the time of planting. In a further experiment the runners of an infested plant kept free from Aphids developed normally, while the leaves of one runner that was allowed to become infested naturally, though normal at first, showed stunted development, crinkling and discolouration as soon as the Aphids became numerous. Runners of infested plants are weakened and develop slowly, and are thus more susceptible to attack by the Aphids, which easily spread to them from the parent plant. Infested plants were seen to have correspondingly weakened root systems. It has been suggested that the injury may be caused by a virus carried by the Aphid, and the symptoms resemble those of a supposed virus disease recorded in California [*R.A.E.*, A, xiv, 62, 446], but no indication of the presence of a virus was observed in the course of these studies. *C. fragariae* does not appear to lay eggs in winter on any part of the plant above ground, and Aphids of different stages, particularly the later ones, were found on the lower surfaces of the leaves up to the beginning of January after prolonged severe frost. Winged forms were produced in autumn under greenhouse conditions. Control measures advocated are dipping runners in a 1 per cent. solution of soft soap containing ·05 per cent. of 98 per cent. nicotine, which kills all Aphids without injuring the plants, before planting in autumn, and the selection of healthy runners from parents free from Aphids.

Parker (T.). **Glasshouse Sanitation.**—*Fertiliser, Feeding Stuffs & Farm Suppl. J.*, xiii, no. 5, pp. 138–139. London, 1928.

It has recently been demonstrated that carnations in greenhouses can be freed from *Tetranychus telarius*, L. (red spider) by vaporising naphthalene in lamps [*R.A.E.*, A, xvi, 338]. The same treatment can be applied to certain other glasshouse plants but with greater risk of damage than in the case of carnations. Spraying, especially with petroleum emulsions, is of considerable value against *T. telarius*, but the petroleum must be of a certain gravity and viscosity and free from deleterious compounds containing sulphur, and such sprays can only be regarded as an emergency measure. Just before seeking shelter for hibernation, that is during August and when the vitality of plants is on the wane, the mites are generally at their maximum, and this is obviously the time to attack them. Houses of about 44,000 cu. ft. capacity were therefore experimentally fumigated for 24 hours with a high concentration (13½ oz.) of naphthalene vaporised in lamps during daylight and shortly prior to pulling up the plants. This was followed by a fumigation of formaldehyde vaporised in the same way, using 5 fl. oz. per 1,000 cu. ft. capacity, to destroy fungus spores. The temperature throughout was 60–70° F. After the first fumigation no active mites remained, and any adult whiteflies [*Trialeurodes vaporariorum*, Westw.] present were killed. In the following season the mites appeared later in the season than in unfumigated houses which had received the usual washing down. No definite results can be claimed from this preliminary trial but the method is much cheaper than washing down with emulsified cresylic acid, which involves much time and labour. Fumigation with formaldehyde alone produced little result on either pest. As most of the washing down is done during November and December, when the mites have probably reached their winter quarters, very little is achieved by this treatment, and it is doubtful whether burning sulphur is of much use.

Dattin [E.]. **Note sur** *Plodia interpunctella* **Hb., lépidoptère nuisible dans l'industrie de l'alimentation, à Nantes.**—*Bull. Soc. Sci. nat. Ouest Fr.* (4) vii, no. 1–2, pp. xii–xiv. Nantes, 1927.

Plodia interpunctella, Hb., is recorded from a factory in Nantes in almonds covered with chocolate. This moth probably has two generations a year; eggs laid in May or June give rise to adults in August and September, and the eggs laid by these hatch in about a fortnight, producing larvae that develop slowly and pupate at the end of March. The larvae feed on dried vegetable matter, including almonds, figs, raisins and biscuits, and pupate in cocoons. The best method of control is to destroy the adults when they are seen flying at dusk and to keep boxes containing their favourite foodstuffs well closed.

Rambousek (F.). **Feststellung und die Bestimmung der Rübenschädlinge.** [The Recording and Identification of Beet Pests.]—*Z. Zuckerind. čsl. Rep.*, [li] pp. 305–310. Prague, 1927. Reprinted in *Ber. ForschInst. čsl. Zuckerind*, xxxi, pp. 335–340. Prague, 1928.

Notes are given on the methods to be followed in order to discover the insect pests of beet, and a key is given to the pests of this plant in Czechoslovakia, arranged according to the parts of the plant infested and the type of injury caused.

Lüstner (G.). **Ein** *Adoxus vitis*-**Herd.** [A Centre of Infestation by *A. obscurus* var. *villosulus*.]—*Anz. Schädlingsk.*, iv, no. 4, pp. 38–41, 6 figs. Berlin, 15th April 1928.

In 1927 there was a severe infestation of a vineyard in south Germany by the Eumolpid, *Adoxus obscurus* var. *villosulus*, Schr. (*vitis*, auct.). The author considers this form to be specifically distinct from *A. obscurus*, L., which appears to occur on *Epilobium* and not on vine. The eggs are laid in cracks in the bark, in batches of 15–20. The larvae migrate to the roots, in which they mine, and in the present case many vines were almost killed as a result. Half-grown and mature larvae were found in December. Pupation takes place in an earthen cell, and the long flight-period has been attributed to the fact that the pupae are at varying depths, so that the warmth from the surface of the ground does not affect them all at the same time. In Germany the larvae are of less importance than in Hungary, France and California, but the adults often attack the leaves and small stems, and the skins of the grapes.

Hengl (F.) & Reckendorfer (P.). **Ueber die Prüfung von Schweinfurtergrün und die Herstellung von Schweinfurtergrünbrühen.** [On Tests of Paris Green and the Preparation of Paris Green Sprays.]—*Anz. Schädlingsk.*, iv, no. 4, pp. 41–46, 2 figs. Berlin, 15th April 1928.

The bulk of the technical information given here was published in another paper previously noticed [*R.A.E.*, A, xv, 57]. A table is given showing the results of tests with eighteen brands of German or Austrian manufacture. Foliage injury may be due to the Paris green being too easily deposited, to a too high content of water-soluble arsenious acid, or to incorrect preparation of the spray solution. The lime content must be kept down, one suitable formula being 100 gals. water, 10 lb. copper sulphate, 1½ lb. Paris green, and 15 lb. quick lime. The solution need only be slightly alkaline, and with a fine mist-spray, there should be very little scorching.

Torka (V.). **Ein Schädling des weissen Senfs** (*Sinapis alba* **L.**). [A Pest of White Mustard.]—*Anz. Schädlingsk.*, iv, no. 4, p. 47. Berlin, 15th April 1928.

The sawfly, *Athalia colibri*, Christ, is rarely reported as a pest of crucifers, but in July 1927 a field of white mustard, *Sinapis alba*, in Upper Silesia, Prussia, was infested by the larvae, which destroyed the blossoms and then attacked the leaves. The plants were mown and used as fodder, but this was done too late to prevent the larvae pupating in the ground. The parasites observed were an Ichneumonid, *Perilissus lutescens*, Holmgr., and two Tachinids, *Lydella nigripes*, Fall., and *Tachina erucarum*, Rond., but they were not present in such numbers as to preclude injury in 1928. The larvae may be destroyed by sprinkling the plants with kainit.

Steyer (—). **Starkes Auftreten des Hausbockes** (*Hylotrupes bajulus* **L.**) **in Lübeck.** [An Outbreak of *H. bajulus* in Lübeck.]—*Anz. Schädlingsk.*, iv, no. 4, pp. 47–48. Berlin, 15th April 1928.

Hylotrupes bajulus, L. has appeared in considerable numbers in Lübeck, usually in buildings 20–25 years old, the timber involved being nearly always Pomeranian or Swedish sawn timber in the roofs. Most of these buildings have ventilator shafts, which conduct warm air to the ceilings. The only feasible measure is the replacement of infested timber by sound, specially impregnated wood.

Krausse (A.). **Einige Notizen über den grossen grauen Rüsselkäfer** (*Coniocleonus glaucus*, **F.**). [Some Notes on the big grey Weevil, *C. glaucus*).]—*Ent. Bl.*, xxiv, no. 1, pp. 24–27, 1 pl. Berlin, 31st March 1928.

In Germany, *Coniocleonus glaucus*, F., gnaws the twigs of pine (the injury being indistinguishable from that of *Hylobius abietis*), and also attacks the young leaves of hornbeam and oak.

[Pokrovskiĭ (E. A.).] **Покровский (Е. А.). Experiments with Cultural Measures as a Means of Control against the Swedish Fly.** [*In Russian.*]—*Trud. Opuitno-Issled. Uchastka Stantz. Zashch. Rast. Vred. Moskovsk. Zemel. Otd.*, pt. 1, pp. 9–20. Moscow, 1927.

In order to determine the effect of different times of sowing on infestation of spring wheat and barley by *Oscinella frit*, L., sowings were made in 1924 on 16th May, 26th May and 6th June. The plants appeared on 26th May, 3rd June and 13th June, and even in the last sowings, which were those least attacked, the injury amounted to as much as 22–27 per cent. It is possible that still earlier sowings would prove resistant to attack, provided that the plants could reach the 4–5 leaf stage before the period of oviposition. Examination of the soil and of the stubble of both winter and spring crops has shown that they are very sparsely inhabited by *O. frit* or other pests and that, under the conditions existing in 1924, the ploughing under of such stubble would not have resulted in any apparent reduction of their numbers. Similar examinations, however, should be made in other years.

[Durnovo (Z. P.).]. **Дурново (З. П.) Flax Flea Beetles in Connection with the Time of Sowing of Flax.** [*In Russian.*]—*Trud. Opuitno-Issled. Uchastka Stantz. Zashch. Rast. Vred. Moskovsk. Zemel. Otd.*, pt. 1, pp. 21–43, 2 pls., 3 charts, 5 refs. Moscow, 1927.

The flea-beetles, *Longitarsus parvulus*, Payk., and *Aphthona euphorbiae*, Schr., cause considerable injury to flax in the Government of Moscow. An account is given of their life-history and habits [*cf. R.A.E.*, A, xi, 154] and of experiments with different dates of sowing as a means of protecting the crop. Late sowings (end of May and beginning of June) are least liable to attack by the flea-beetles, and when attacked, are better able to outgrow the injury. Very early sowings (29th April) may escape injury, but under ordinary weather conditions they cannot be made or may be subject to attack owing to the slow growth of the plants.

Ploughing at the time the plants are pulled will destroy a large number of the flea-beetles that have not yet emerged from the soil, but the value of this method should be further tested on a larger scale.

Various dusts applied in the spring did not adhere very well to the small plants, except immediately after rain, and it was necessary, owing to the prolonged migration of the flea-beetles from their hibernating quarters, to make several applications. In the summer, when the plants are larger, it is easier to cover them thoroughly, and the flea-beetles emerging from the soil are more concentrated on the plots. Paris green caused scorching of the plants ; calcium arsenate and lead arsenate killed all the beetles when combined with 2 parts of slaked lime. At weaker or stronger concentrations these dusts were less effective, calcium arsenate being less effective in each case than lead arsenate.

The unidentified Braconid already recorded by Kurdyumov [xi, 154, 155] attacks both *A. euphorbiae* and *L. parvulus* ; it has two generations a year, and during 1922 the parasitism of each species amounted to 18 per cent. *L. parvulus* is also attacked by Nematodes.

Minor pests of flax are *Phytometra* (*Plusia*) *gamma*, L., *Phalonia* (*Conchylis*) *epilinana*, Zell., *Heliothis dipsacea*, L., *Selatosomus aeneus*, L., and various species of *Agriotes*.

[Vasina (A. N.).] **Васина (А. Н.). The Cabbage Fly** (*Hylemyia brassicae*, **Bch., and** *H. floralis*, **Fall.).** [*In Russian.*]—*Trud. Opuitno-Issled. Uchastka Stantz. Zashch. Rast. Vred. Moskovsk. Zemel. Otd.*, pt. 1, pp. 63–89, 3 pls., 3 refs. Moscow, 1927.

The cabbage flies cause considerable injury to cruciferous crops in Russia. Most of the damage has previously been attributed to *Phorbia* (*Hylemyia*) *brassicae*, Bch., but as a result of observations extending over several years (particularly 1923–25) in various localities of the Moscow Government, it has been found that though this species is mainly responsible for the damage caused in seedbeds in the spring, *P.* (*H.*) *floralis*, Fall., which attacks the plants in the field, is of greater importance in summer. The characters differentiating the two species are described.

P. brassicae passes the winter as an adult, pupa or second or third instar larva. The larvae and pupae usually hibernate near the roots of *Barbarea vulgaris*. The winter infestation of this plant amounts to 10–14 per cent., as compared with only 2–3 per cent. of the cabbage stumps left in the field after harvest. The eggs are laid between 28th April and 20th May; they are not laid until about ten days after the temperature has reached 12° C. [53·6° F.]. Cabbages and radishes are the preferred plants for oviposition; red cabbage was only attacked when it was planted in seedbeds containing larvae left from the roots of transplanted white cabbage. The eggs hatch in 5–12 days. The larval and pupal stages last 20–30 and 12–32 days respectively. The generations overlap considerably, and their number varies in different years; it is estimated that in 1920 there were three generations with a partial fourth. A considerable number (as many as 38·2 per cent. in 1925) of the pupae of the first generation enter a diapause until the following spring. The adults are therefore most abundant in spring as they emerge from these pupae as well as from a certain proportion of those of each of the other generations. It is also believed that some of the second generation adults migrate to wild crucifers. Apparently only the first generation larvae are of any importance as pests of cabbages, swedes and radishes, but those of the second attack turnips, though they do not usually cause any considerable loss to this crop.

As the eggs of *P. brassicae* are usually laid in the first or second third of May, it should be possible to sow the seed so that the seedlings are ready for transplanting by this time. Should they be infested, the eggs will not have hatched and can therefore be easily destroyed by dipping the roots in some insecticide. The results of four years' observations indicate that the transplanting of uninfested seedlings ensures a healthy crop. Injury to cabbage in the field by the larvae of the first generation was recorded from certain localities in 1925, but this is believed to have been due to exceptional meteorological conditions. Should such injury be repeated, however, it would be advisable to sow a limited amount of cauliflower or Chinese cabbage as a trap-crop. Seedlings may be protected by covering them with muslin stretched across a frame.

A solution of mercury bichloride at the rate of 1 part to 800–1,500 parts water by weight killed all the eggs when watered on the soil. Two or three applications should be made at intervals of a week, beginning as soon as oviposition is noticed. If there is any possibility of missing this period, the first application should be made 7–10 days after the seedlings appear. Though the strongest concentration did not injure the older plants, 1–1,200 is effective and safer. This treatment does not apparently kill the larvae even at stronger concentrations. Applications should be made with a watering can without the rose; it is sufficient to wet the earth to a depth of $1\frac{1}{3}$ to 3 inches [not 21 inches, as erroneously stated in a previous abstract, *R.A.E.*, A, xiii, 545], about 3 gals. of the solution being sufficient for 150–200 seedlings or 60–70 plants in the field. Experiments with carbolic acid emulsion were not satisfactory. Limited experiments on the disinfection of the roots before transplanting show that kerosene-soap emulsion injures the plants, soft soap produces a better crop than is obtained from infested plants, while mercury bichloride produces even a better crop than is obtained from healthy untreated plants.

As the observations on *P. floralis* were only started in August 1924, the oviposition period was not definitely ascertained, but it is believed to occur during the first ten days of June, the larvae being chiefly noticeable in the second half of July and in August. In Moscow there is one generation a year, hibernation occurring in the pupal stage, or in isolated cases as adults. Under laboratory conditions eggs were laid about 6 or 7 days after emergence, either directly on the soil or on the plant where the lower leaves join the stem, though the latter is unusual and probably the result of some special circumstances. The eggs are mostly laid near cabbages, cauliflowers and radishes ; a few were found near swedes and turnips, but none near wild crucifers. In some localities red cabbages appeared to be preferred. Under artificial conditions eggs placed between damp filter paper hatched in 7 or 8 days at a temperature of 18°–23° C. [64·4°–73·4° F.], and the larval stage lasted 35–40 days. The larvae can withstand starvation for a week and can travel a considerable distance in the soil ; they may go as deep as 16 ins. for pupation, though they usually pupate at a depth of about 5½–11 ins. Infestation was very severe in some districts in 1924, as many as 300–700 larvae occurring on one cabbage ; turnips and swedes were completely hollowed out, but carrots and beets growing near were not attacked. Both red cabbage and cauliflower suffered severely and had to be harvested early.

As the damage by the larvae begins about the second half of July, early plantings of the early and quick maturing varieties are of undoubted value. Even slower growing varieties will be better able to withstand the attack if planted early. Under laboratory conditions mercury bichloride in concentrations of 1 : 1,200, or stronger, killed all the eggs, and although four applications might be needed to cover the entire oviposition period, this method seems to be the most promising at present. The removal of the eggs from the plants is very tedious and difficult as the plants are easily injured. In experiments with cotton wool soaked in carbon bisulphide and placed in the soil at a depth of 5–7 ins., the larvae were killed where the applications were made on either side of the plant, but further experiments are necessary to ascertain the exact dosage required to be effective without injury to the plants. Carbon bisulphide was also tried against the pupae, but the cost of time and labour do not warrant its use for this purpose. Tobacco dust applied to the soil under the plants did not prevent oviposition, as eggs were found actually on the dust. Whether the larvae hatching from these eggs are killed was not ascertained, but the crop from the plot thus treated was much greater than from an untreated plot.

The pupae of both *P. brassicae* and *P. floralis* are parasitised by larvae of the Staphylinid, *Aleochara bilineata*, Gyll., and by the Cynipid, *Eucoela* (*Psichacra*) *spinosa*, Hart. The adults of *Aleochara* destroy both larvae and pupae.

[Vasina (A. N.).] **Васина (А. Н.).** *Ceuthorrhynchus quadridens*, **Panz., the Cabbage Stem Weevil, a Pest of Cruciferous Plants.** [*In Russian.*]—*Trud. Opuitno-Issled. Uchastka Stantz. Zashch. Rast. Vred. Moskovsk. Zemel. Otd.*, pt. 1, pp. 91–109, 3 pls., 21 refs. Moscow, 1927.

Ceuthorrhynchus quadridens, Panz., is probably as important a pest of cabbage as *Phorbia brassicae*, Bch., in the Moscow Government.

This paper collates the work of previous authors, much of which has been taken from this *Review*, and also includes personal observations. The various stages of the weevil are described. Hibernation occurs as an adult, emergence in the spring occurring when the average daily temperature has been 9·7° C. [49·4° F.] for ten days and then reaches 12·7° C. [54·8° F.]. The injury caused by the feeding of the adults on the plants is negligible, the chief damage being done by the larvae. The adults emerging from hibernation are not all sexually mature, probably owing to the fact that some have emerged from the pupae in the summer and others in the autumn. It is possible that some adults pass through two winters. The eggs are mainly laid on the lower surface of the leaf in the centre vein or on the leaf stem. They have been found on cauliflower, Chinese cabbage, turnips and swedes, but not on wild crucifers, though these are recorded by other authors. Oviposition lasts from the middle of May to the middle of August. The average daily temperature during the ten days preceding oviposition was not below 12° C. [53·6° F.]. The larvae hatch in 5–7 days and immediately enter the stem or vein and travel downwards towards the main stem. The injured leaf breaks off easily, thus exposing the round gallery of the larva. When the larvae are numerous, the entire centre of the stem is hollowed out ; over 80 have been found in one plant. When mature, they make an opening through the stem near the soil surface and pupate, either on the surface or in the soil, usually at a depth of about 2 ins. The larval stage usually lasts about 3 weeks but may extend to 2 months or more. The pupal stage lasts about 3 weeks.

During 1923 and 1924, 30 and 14 per cent. of the larvae respectively were parasitised. The parasite has not been determined; it is able, owing to its long ovipositor, to reach the larvae within the stem of the plant.

Clean cultivation and the careful picking out and destruction of all infested plants at the time of transplanting is important in the control of *C. quadridens*. In the case of heavy infestation the soil around the plants should be slightly loosened at weekly intervals (from June onwards in the Moscow Government) as the pupae in the soil are easily affected by mechanical injuries. Laboratory experiments have been made with soft soap (15 gms. to 380 gms. of water), carbon bisulphide (5 cotton wool balls at a distance of 4·5 cm.) and mercury bichloride (2 gms. to 380 gms. of water) using 30 cocoons in each experiment and the same number as a control. From the latter, 28 weevils emerged, none from those treated with mercury bichloride, and 6 and 4 respectively from those treated with soft soap and carbon bisulphide. Covering the seedlings with muslin is effective but expensive. The adults may be shaken off the plants on to a small shovel, which has a piece cut out to fit round the cabbage stump, and then destroyed.

[Pokrovskiĭ (E. A.).] **Покровский (E. A.). Experiments with various Materials for the Control of** *Psylla mali*, **Schmidb., in the Egg Stage.** [*In Russian.*]—*Trud. Opuitno-Issled. Uchastka Stantz. Zashch. Rast. Vred. Moskovsk. Zemel. Otd.*, pt. 1, pp. 133–138, 3 refs. Moscow, 1927.

Previous recommendations for the control of *Psylla mali*, Schmidb., are reviewed. In the past iron (ferrous) sulphate has given the most promising results in two applications, but as only one spray is applied by growers in the Government of Moscow, experiments were made in 1923 to ascertain the best time for the single spray. Applications were made with 6 and 12 lb. iron sulphate to 12 gals. water, both with and without the addition of flour or lime. Spraying was done on 26th April and 3rd and 8th May, *i.e.*, 23, 15 and 10 days before the first eggs hatched. The best results were obtained from the earliest applications, trees treated with the weaker solution combined with an equal amount of lime or 1 lb. of flour being practically free from infestation. Lime gave better results than flour, and the addition of either gave better results than iron sulphate alone. Only the higher strength gave positive results either with or without the addition of lime or flour in the later sprayings. Barium chloride and mercury bichloride were tried in 1924 and compared with iron sulphate. Mercury bichloride was used at the rate of 1 : 1000, 1 : 500 and 1 : 250, the percentage of eggs killed being 25·9, 49·5 and 96·1 respectively, as compared with only 7·5 per cent. killed by 6 lb. iron sulphate to 6 lb. lime and 12 gals. water, 17 per cent. by 12 lb. iron sulphate to 12 gals. water, and 23·9 per cent. by 8 lb. barium chloride to 12 gals. water. The mercury bichloride is easily mixed in cold water in a wooden or earthenware vessel and does not injure the trees, but it is expensive.

[GERASIMOV (B. A.).] **Герасимов (Б. А.). Spring Control of the Cabbage Fly** (*Hylemyia brassicae*, **Bch.**). [*In Russian.*]—*Sad i Ogorod*, 1927, no. 3, reprint, 8 pp., 4 refs. Moscow, 1927.

This is a popular account of *Phorbia* (*Hylemyia*) *brassicae*, Bch., and its control in Moscow. Most of the information has already been noticed [*R.A.E.*, A, xvi, 412]. The percentage of infestation may be considerably reduced by applying tobacco dust to the soil near the stems of the plants. Applications should be made two or three times at intervals of 7–8 days and renewed after rain.

PAPERS NOTICED BY TITLE ONLY.

DA COSTA LIMA (A.). **Segundo catalogo systematico dos insectos que vivem nas plantas do Brasil e ensaio de bibliographia entomologica brasileira.** [Second (revised) systematic List of the Insects living on Plants in Brazil and a Bibliography of Brazilian Entomological Literature.]—*Arch. Escola sup. Agric. e Med. vet.*, viii, no. 1–2, pp. 69–301. Rio de Janeiro, 1928. [*Cf. R.A.E.*, A, xi, 366.]

PORTER (C. E.). **El** *Margarodes vitium* **Giard. (Notas sinonímicas, zoogeográficas y bibliográficas.)**—*Bol. Soc. ent. argentina*, iii, no. 3, pp. 1–8, 2 figs. Buenos Aires, 31st December 1927.

ERTOGROUL (T.). **Emploi de la lumière de Wood dans le diagnostic précoce de la grasserie des vers à soie.** [The Use of Wood's Light [ultra-violet rays approximately monochromatic, of about 3650 Å] in the early Diagnosis of Grasserie in Silkworms (*Bombyx mori*).]—*C.R. Acad. Sci. Fr.*, clxxxvi, no. 26, pp. 1865-1867, 4 refs. Paris, 1928.

GREEN (E. E.). **Observations on the British Coccidae. XI. With Descriptions of new Species.**—*Ent. Mo. Mag.*, lxiv, pp. 20–31, 6 figs. London, January & February 1928.

WHITEHEAD (H.). **Metabolism of Larvae and Pupae of the Large Cabbage White Butterfly** [*Pieris brassicae*].—*Naturalist*, 1928, no. 856, pp. 147–148. London, May 1928.

[Korol'kov (D. M.).] **Корольков (Д. М.). The Common Red Spider** (*Tetranychus telarius*, **L., Tetranychidae, Arachnoidea**) **in the Moscow Government.** [*In Russian.*]—*Trud. Opuitno-Issled. Uchastka Stantz. Zashch. Rast. Vred. Moskovsk. Zemel. Otd.*, pt. 1, pp. 111–131, 4 figs., 1 ref. Moscow, 1927.

Tetranychus telarius, L., is one of the most serious pests of cucumbers in the Moscow Government. Plants grown under glass are very heavily attacked, and sometimes the entire crop may be lost. The life-history and habits of the mite are briefly discussed. A high temperature induces greater activity, including more abundant and more frequent oviposition. Increased humidity, particularly with a lowered temperature, has an adverse effect on the mites, and under the usual hothouse conditions they are more numerous and more active in the upper, well ventilated boxes, and least numerous in those below that are frequently watered to maintain the necessary humidity in the house. They feed on the leaves, fruit, flowers and stems, the injury being augmented by the general soiling of the plants by their webs and excreta, which usually cover the lower surface of the leaves.

To prevent infestation, weeds should be kept down in and near the greenhouses, and all plants that have ceased bearing should be burnt or treated with boiling water ; the soil from the boxes in the hothouses should be removed, and all wooden parts, boxes, supports, etc., scalded. It is advisable to lime-wash the walls and beams, thereby filling any cracks that would serve as hibernation quarters. Seedlings and pollen should not be taken from infested to uninfested houses.

Hydrocyanic acid gas fumigation was tried in varying concentrations and exposures, but when complete control was obtained, the plants were considerably injured. Carbon bisulphide can only be used during warm weather when the houses or frames are empty before planting or after the crop has been gathered. After fumigation, all remains of plants should be removed to ensure the destruction of the eggs.

Dusting with sulphur will kill the mites but not the eggs, so that it must be repeated at frequent intervals, preferably once a week for 3 or 4 weeks. When used at the rate of 7 oz. to about 200 plants or about 5 boxes each 28 ft. long, dead mites were seen on the second and third day, and the effect of the dust continued for several days. Young, healthy plants that have not yet been weakened by the attack of *T. telarius* are not noticeably injured by the treatment, but the unhealthy condition of the older infested plants is increased.

A spray consisting of 1 lb. soap to 3 gals. water gave excellent results when applied before the leaves were too dense and while it was still possible to reach the lower surface, where most of the mites collect. The leaves are sometimes injured, but it is probable that the effects of the soap may be prevented by spraying the following day with clean water. The soap spray should be repeated at the end of a week, as the eggs are not killed. Flour paste in strengths varying from about 2 to 5 oz. wheat flour to 1 gal. water gave fairly good results, but not complete control. It was tried as a spray and by dipping the leaves into the paste, but the mites under the webs are not affected by it. In some localities the attack by the red spider on cucumbers in the field reduced the period during which the plants bear fruit by 3–4 weeks. On the whole the proportion of damage is higher in the field than in the hothouses and frames. Continued hot weather with a temperature of about 25° C.

[77° F.] during the hot hours of the day favours the rapid development of the mites, the eggs hatching in about 5 days, while the plants are more susceptible than under cooler conditions.

Dusting with sulphur in the field was greatly hindered by rain and wind, but the infestation was sufficiently reduced to save the crop. About 1 lb. sulphur was required for each 56 sq. yds.

[BEÌ-BIENKO (G. Ya.).] **Бэй-Биенко (Г. Я.). Synopsis of the Larvae of the West Siberian Grasshoppers. (Orthoptera, Acrididae.)** [*In Russian.*]—*Trud. Sibirsk. Inst. S.-Kh. i Lesovodstva*, ix, reprint, 39 pp., 11 figs., 9 refs. Omsk, 1928. (With a Summary in English.)

Very little attention has been paid hitherto to the immature stages of grasshoppers, though it is of the greatest importance to be able to distinguish species in the early stages as these are usually more harmful than the adults. Detailed descriptions of the various larval stages of all the more common West Siberian grasshoppers are given, with keys to the genera and species.

The larvae of different species hatch at various times in spring ; in the forest zone of West Siberia the earliest species are *Omocestus viridulus*, L., and *Gomphocerus sibiricus*, L., while in the forest-steppe zone the last-named and *Chrysochraon brachypterus*, Ocsk., appear before any others. In all species observed there is an interruption in embryonic development during the winter, even when the eggs are kept in a warm room.

Larvae of the first two or three instars are usually found in the places where they hatched, but the older larvae and adults often migrate to other habitats, usually covered with better vegetation ; females at the time of oviposition, however, return to the original habitats. Thus, the ecological requirements of a species vary during the individual development.

Fallow-lands represent the most favourable conditions for the oviposition of a number of economically important species, and it appears that the system of fallow-land agriculture is one of the most important causes of periodic outbreaks of grasshoppers in West Siberia.

HADDEN (F. C.). **Some Injurious Insects of Formosa.**—*J. Pan-Pacific Res. Inst.*, iii, no. 1 [*i.e.* 2], pp. 13–14. Honolulu, Hawaii, 1928.

Of the insects attacking camphor in Formosa, the following are the most important : *Papilio sarpedon*, L., *Athalia* sp., *Termes* (*Odontotermes*) *formosanus*, Shiraki, *Icerya purchasi*, Mask., *Aulacaspis cinnamoni*, Newst., and *Aleurocanthus* (*Aleurodes*) *spinosus*, Kuw. The more important species attacking tea include, in addition to those already noticed [*R.A.E.*, A, xii, 335 ; xiii, 225], an Oecophorid, *Lactistica* sp., and a Geometrid, *Biston marginata*, Matsm., the larvae of which defoliate the plants, and two Psychids, *Clania* sp. and *Mahasena* sp. The most destructive insects attacking sugar-cane are *Chilo infuscatellus*, Sn., *Eucosma schistaceana*, Sn., and *Diatraea venosata*, Wlk. (*striatalis*, Sn.), the larvae of which bore in the cane stalks ; *Oregma lanigera*, Zehnt. (woolly aphis) ; *Alissonotum impressicolle*, Arr., the larvae of which attack the roots ; wireworms and termites. Rice pests include *Lema melanopa*, L., *Hispa armigera*, Ol., *Schoenobius bipunctifer*, Wlk. (*incertellus*, Wlk.), *Chilo simplex*, Butl., and *Oxya* *velox*, F. Bananas are attacked by *Cosmopolites sordidus*, Germ., which has only recently been accidentally introduced, and an Aphid, *Pentalonia* sp. Oranges are infested by a Lamiid, *Melanauster chinensis*, Forst., which bores in the trunk and branches, the fruit-fly, *Dacus dorsalis*, Hendel, and several Coccids.

VENKATRAMAN (T. S.) & THOMAS (R.). **A Leaf Adaptation conducive to Mosaic Resistance in the Sugarcane.**—*Agric. J. India*, xxiii, pt. 1, pp. 56–57, 2 figs., 4 refs. Calcutta, January 1928.

Examination of the leaves of several varieties of sugar-cane showed that those of Kassoer, a variety widely acknowledged to be immune from mosaic disease, possess on their surface, in common with Glagah (a grass that is one of the parents of this variety and has also been found to be immune), stiff, unicellular bristles, which from their position and arrangement would protect the stomata and the surrounding regions from the attack of insects likely to transmit the disease. The susceptible, broad-leaved varieties examined either do not possess these bristles or have them in small numbers.

Other adaptations suggested as conducive to mosaic resistance are compactness and rigidity of the leaf tissues and the presence in the tissues of substances that counteract the virus when introduced.

KUNHI KANNAN (K.). **The Control of Cactus in Mysore.**—*Mysore Agric. Calendar 1928*, pp. 16–17, 1 pl. Bangalore, 1928.

Dactylopius tomentosus, Lam. (cochineal insect) has been introduced into Mysore from Ceylon to act as a control for the cactus, *Opuntia monacantha* ; it is not, however, possible to ascertain at present whether it will prove effective under Mysore conditions.

CHOPRA (R. L.). **Annual Report of the Entomologist to the Government, Punjab, Lyallpur, for the year 1925-26.**—*Rep. Dept. Agric. Punjab, 1925–26*, pt. 2, vol. i, pp. 67–125. Lahore, 1928.

During March and April the life-cycle of *Earias insulana*, Boisd. (spotted bollworm) on cotton lasted 31–50 days in the laboratory as compared with 35–61 days in the field; *E. fabia*, Stoll, is recorded as a pest, but was less numerous than *E. insulana*. *E. cupreoviridis*, Wlk., was recorded from hollyhock and *Sida cordifolia* in one locality in August, and an unidentified species of *Earias* taken from *Corchorus* [*R.A.E.*, A, xv, 489] fed on the pods of bhindi [*Hibiscus esculentus*] in captivity, but not on the flower buds of cotton. Trap-crops of *H. esculentus* proved very successful against *E. insulana*, and satisfactory results are obtained by the distribution of the parasite *Microbracon* (*Bracon*) *lefroyi*, D. & G. The eggs of *Platyedra gossypiella*, Saund. (pink bollworm) were collected during October and December, and larvae were present in some localities from July 1925 until January 1926. No seed from infested areas was free from attack, but seed samples that had been ginned by the hand gin were in all cases free. All larvae are killed by soaking the seed in water at 57–58° C. [134·6–136·4° F.] for five minutes. *H. esculentus* is recorded as a food-plant of this moth for the first time in the Punjab. *E. fabia* and *E. insulana* were parasitised by *M. lefroyi*, *Rhogas testaceus*, Grav., *Brachymeria* (*Chalcis*) *tachardiae*, Cam., which also attacked *Sylepta derogata*, F.

(cotton leaf-roller), *Actia aegyptia*, Vill., *Elasmus* sp. and *Apanteles* sp. *M. lefroyi* was bred in small numbers for the first time from *P. gossypiella*, the larvae of which are also parasitised by *Apanteles* sp. *Sphenoptera gossypii*, Cotes (cotton stem-borer) was observed as early as June in one district, while in another a few eggs and larvae were observed in October ; the extent of attack varied from 1 to 14 per cent. ; of two plots, however, which were treated with unslaked lime at the rate of about 5 cwt. to the acre, one was entirely uninfested and on the other the attack was 0·9 per cent. Minor pests of cotton included *Tarache notabilis*, Wlk., *Xanthodes* (*Acontia*) *graellsi*, Feisth., *Cosmophila erosa*, Hb., *Phycita infusella*, Meyr. (which was parasitised by *M. lefroyi*, *Oncochalcis* (*Chalcis*) *rufescens*, Cam., and *Apanteles* sp.), *Dichocrocis punctiferalis*, Guen., *Myllocerus blandus*, Fst., *Heliothis obsoleta*, F., *Euproctis fraterna*, Mo., *E.* (*Porthesia*) *xanthorrhoea*, Koll., and *Dasychira securis*, Hb.

Sugar-cane was seriously infested in September by an unidentified Pyralid, the larvae of which bore in the top shoots. Other borers attacking sugar-cane were *Scirpophaga* spp., *Emmalocera* and *Diatraea auricilia*, Dudg. Maize, rice, jowar [*Sorghum*] and grasses were attacked by *Chilo simplex*, Butl., *Sesamia* and a green borer ; about half the shoots examined were attacked by borers, about 80 per cent. of this damage being due to *C. simplex*. Notes are given on the seasonal occurrence of these borers and the type of injury caused by them, with a list of their parasites, the majority of which are unidentified. *Trichogramma minutum*, Riley, parasitised the eggs, the maximum rate of parasitism, 60 to 80 per cent. during August and September, being reached on *D. auricilia* and *C. simplex*. The most common pests attacking the leaves of sugar-cane were *Dasychira* sp., *Parnara mathias*, F., *Laphygma exigua*, Hb., *Pyrilla aberrans*, Kirby, and *P. perpusilla*, Wlk., the last two seriously damaging the crop in one locality towards the end of April. The life-cycle of these two Lophopids lasts about 52 days from April to June. They breed on sugar-cane from April to February, migrating to wheat and various wild grasses when the crop is harvested. The collection of adults by hand nets was found to be a very successful means of control, and the use of a hopperdozer also gave fairly satisfactory results. Maize was ineffective as a trap-crop. An Encyrtid parasite attacks the eggs, parasitism reaching 93 per cent. in one case, and a few Dryinids were reared from the larvae, while the Coccinellid, *Brumus suturalis*, F., was predacious on the eggs. In one locality cane was rather severely attacked by the Aleurodid, *Aleurolobus barodensis*, Mask.

Laphygma exigua, Hb. (lucerne caterpillar), the bionomics of which are discussed, was collected in large numbers from lucerne and gram [*Cicer arietinum*]. Parasites of the larvae included *Microplitis* sp. Heavy irrigation of the lucerne fields soon after a severe attack destroys any larvae on the ground as well as the pupae under the soil. *Heliothis obsoleta*, F., which bores in the pods, is an important pest of gram, other plants attacked including lucerne and mint. Notes are given on its life-history ; *Chelonus* sp. and *Atractodes* spp. were bred from the larvae. A few experiments indicated that irrigation of the soil might destroy the hibernating pupae. The cutworms, *Agrotis flammatra*, Schiff., *Euxoa spinifera*, Hb., *E. segetum*, Schiff., and *A. ypsilon*, Rott., do great damage to the gram crop. Various baits gave fairly good results, while laboratory experiments suggest that flooding the fields would prove an effective control measure. A few Tachinids and the Ichneumonid, *Fileanta rufocauda*, Cam., were bred from larvae collected in the gram fields. *Hispa armigera*, Ol., was responsible for a good deal of damage in rice fields in one locality.

Observations were made on the life-history of *Phyllocnistis citrella*, Stn. (citrus leaf-miner); in experiments tent fumigation with hydrocyanic acid gas killed all the larvae in the leaves. Experiments were also made with potassium cyanide crystals, introduced into small holes in the stems of the plants and plastered over with mud. With amounts of crystals varying from 0·5 to 1·5 gms., 65–95 per cent. of the larvae were killed in trees 3–8 ft. high. Other pests of *Citrus*, on which brief notes are given, included *Papilio demoleus*, L., *P. polytes*, L., *Euproctis fraterna*, Mo., *Tonica zizyphi*, Stn., and the citrus psylla [*Diaphorina citri*, Kuw.]. *Idiocerus atkinsoni*, Leth., and *I. clypealis*, Leth., are sometimes responsible for the total failure of the mango crop. *Monophlebus stebbingi* var. *octocaudatus*, Gr., is also a pest of mango and attacks a great variety of plants; sticky bands are an effective control measure [*cf. R.A.E.*, A, xiii, 607].

Experiments were carried out with attractants for *Dacus* (*Chaetodacus*) *cucurbitae*, Coq., infesting cucurbits and two unidentified fruit-flies attacking *Zizyphus jujuba* and peaches, citronella and eucalyptus oils giving the best results. *D. cucurbitae* also infested dates and guavas. Pomegranates were attacked by *Virachola isocrates*, F. Light traps were found to be a very successful means of control for *Amsacta* sp. and *Diacrisia* sp., which attacked a great variety of plants, including cotton, maize and wheat.

Vegetable pests were: *Aulacophora atripennis*, F., *Epilachna dodecastigma*, Muls., and the Pentatomid, *Aspongopus janus*, F., on cucurbits; *E. vigintioctopunctata*, F., on solanaceous plants, especially brinjal [*Solanum melongena*]; and *Bagrada picta*, L., on cauliflower seedlings.

Notes are given on the life-history of *Alphitobius piceus*, Ol., and a Dermestid beetle, which are pests of stored grain. In experiments the larvae of the khapra beetle, *Trogoderma* [*granarium*, Everts] and the adults of *Tribolium castaneum*, Hbst., were controlled with fumigation with calcium cyanide at the rate of about 42 gms. to 100 cu. ft. for 18 hrs. In further experiments with larvae of *T. granarium*, use was made of the fact that the larvae are attracted by some foreign substance, such as a piece of paper, introduced into the grain, and over 6¼ million larvae were collected between November and January by placing coarse sacks on the surface of an infested bin.

Sugar-cane setts were treated with various insecticides against termites, those giving the best results being a 2·5 per cent. solution of mercury bichloride and one of 1 per cent. arsenic, in which the setts were dipped for 5 mins. Chillies [*Capsicum*] are more severely attacked by termites than any other crop, and the results of experiments on the treatment of soil with different chemicals are given; no attack occurred in plots treated with arsenic at the rate of 6·5 oz. and Paris green at 8 oz. per 100 sq. ft., while 25 and 17 per cent. of the seedlings were damaged in two untreated plots; these chemicals should be mixed with ashes to assure an even distribution and avoid injury to the plants. Plants revived if the roots were soaked in 1 to 2 per cent. crude oil emulsion or three per cent. Paris green in the early stages of the attack. Experiments were also made with the treatment of wheat plots; arsenic, crude oil and Paris green were uniformly successful.

Investigations were made with a wide range of local insecticides; a maximum mortality of 12·12 per cent. was obtained in the case of Aphids attacking lucerne and also against *Diaphorina citri* with a concentrated extract of leaves of *Nerium odorum*; macerated juices of *Azadirachta indica* gave a mortality of 25 per cent. used as a contact poison on larvae of weevils on lucerne; 100 per cent. of the adults of *Aulacophora abdominalis*, F., were killed when fed on leaves dusted with powdered leaves of *Datura stramonium*.

Tables are included, giving brief notes on the bionomics of some of the major pests, with lists of insects bred from a variety of food-plants and of the families of parasites bred from various pests.

STEWART (H. R.). **Entomology.**—*Rep. Dept. Agric. Punjab, 1926–27*, pt. 1, pp. 23–28. Lahore, 1928.

A list is given of the pests on which studies were in progress during the year; in addition to a number of those recorded in the preceding paper they include *Dysdercus cingulatus*, F. (red cotton bug) and *Scirpophaga gilviberbis*, Zell. (rice stem-borer).

BARNES (H. F.). **The Gall Midges of Blackberries and Raspberries.**—*J. Pomol. & Hortic. Sci.*, v, no. 2, pp. 137–140, 2 pls. London, March 1926. [Recd. 1928.]

The Cecidomyiids chiefly responsible for damage to blackberry and raspberry in Britain are *Lasioptera rubi*, Heeg. (blackberry stem gall midge), *Dasyneura* (*Perrisia*) *plicatrix*, H. Lw. (blackberry leaf midge), *Contarinia rubicola*, Rübs. (blackberry blossom midge) and *Thomasia* sp. (raspberry cane midge). These gall-midges are briefly described, with notes on their distribution.

The adults of *L. rubi*, which produces hard walnut-shaped galls on the stems of wild blackberry and cultivated raspberry (*Rubus idaeus*), emerge about May or June, when the female lays 8–15 eggs at the base of the buds. The larvae hatch in about 10 days and pierce the epidermis, remaining in the gall, which appears about 3 weeks later, till the following April, when they pupate, the adult emerging about a fortnight later. Cutting out and burning of galls in autumn and winter is the only control measure recommended.

D. plicatrix, the larvae of which cause the leaves to fold and the mid-ribs to become swollen and distorted, oviposits during late May and June on the leaves of dewberries (*R. caesius*) and other species of blackberry, and also cultivated American blackberry, which the larvae leave about 3 weeks later to pupate in the soil. The adults emerge after about 14 days, flying during July and August. The larvae of the second generation pupate in the soil and produce adults in the following May or June. Deep digging beneath the infested bushes in winter and gathering and burning infested leaves are recommended.

C. rubicola oviposits in June and July inside the buds of dewberries and other blackberries at the base of the stamens, causing badly shaped berries, or even preventing fruiting in severe cases. The larvae, of which as many as 27 may be found in a single bud, jump, when fully fed, out of the bud to pupate and hibernate in the soil. The only control measure is the picking and burning of deformed buds in July and August.

Thomasia sp., which has only been observed to attack one variety of raspberry, causes the rind to peel off the canes and kills the top shoots. The larvae become evident in July, and injury decreases by the middle of August, when they leave the canes to pupate in the soil where they hibernate. It is thought that digging calcium cyanide powder into the soil round the canes during the winter will kill the pupae, and a parasite has been reared that killed 100 per cent. of larvae collected from two districts, though a mild attack by the midge occurred subsequently in one of them.

STANILAND (L. N.). **Experiments on the Control of the Apple Capsid Bug.** (*Plesiocoris rugicollis*, **Fieb.**)—*J. Pomol. & Hortic. Sci.*, v, no. 4, pp. 267–274, 4 refs. London, October 1926. [Recd. 1928.]

This is a further discussion of tar distillates used on apple trees as ovicides and of oil and nicotine sprays, with particular reference to their effect on the Capsid, *Plesiocoris rugicollis*, Fall. The actual experiments with tar distillates and the results obtained have already been described [*R.A.E.*, A, xiv, 464]; at 10 per cent. strength the degree of control was very high and practically freed the treated crop from damage by *P. rugicollis*. Lime washing the trees in early spring proved useless. Oil sprays, applied at 2 per cent. strength with a medium fine nozzle and a pressure of 65–70 lb. per sq. in. gave good results, and a wash composed of 8 oz. of 98 per cent. nicotine to 100 gals. of water with sufficient soap to allow of 1 per cent. free soap was also successful. The essential of these contact washes is the time of application.

Notes are given on the distribution of *P. rugicollis* and of its importance as a pest in western England.

WOODMAN (R. M.). **A Survey of some Emulsion Problems confronting the Sprayer.**—*J. Pomol. & Hortic. Sci.*, vi, no. 4, pp. 313–318, 14 refs. London, February 1928.

This paper constitutes a brief survey of the difficulties likely to be encountered in the manufacture and application to trees of miscible oils and stock emulsions. Two types of emulsion, oil-in-water and water-in-oil, may result from the shaking together of the materials constituting an emulsion, the former, which alone represents true dilution of the toxic constituent of the spray, and which can be diluted by any further amount of water, being absolutely necessary to the sprayer. The water-in-oil type can only be diluted with oil. These oils may also be diluted by the addition of a third substance, such as cresol, which makes them soluble in dilute soap solutions, though such solutions cannot be used with very hard water unless it has been previously softened by soap, as the balance of the constituents is altered by the precipitation of insoluble soaps.

Of two forms of emulsions available, the proprietary stock emulsion is an actual semi-solid emulsion of the oil-in-water type, while a miscible oil is a solution of emulsifier in the oil resulting in a liquid of clear consistency, the actual emulsion being produced when this liquid is mixed with water. Emulsifiers may be classified according to which of the two types of emulsion they tend to form. Evidence has been given demonstrating the fact that the relative proportions of the oil and the aqueous emulsifying medium shaken together, and the mechanical treatment given during preparation may determine the type formed, while re-shaking may sometimes cause inversion of a stock emulsion to one of the water-in-oil type. Hardness of water, which constitutes one of the most serious problems, may be temporary, when induced by bicarbonates precipitated as insoluble carbonates on boiling the water; or permanent, when caused by calcium and magnesium chlorides and sulphates so that chemical treatment is necessary to eliminate them; while common salt produces what is known as pseudo-hardness. Even where hard water is softened by soap previous to use for emulsification, the calcium or magnesium soaps formed tend to produce the water-in-oil type of emulsion. Though soaps and resinates are probably the most efficient wetters and spreaders and are the most suitable for incorporation with miscible oils, other emulsifiers such as caseinates, glue, egg-yolk, etc., are recommended for use with hard waters on account of their non-reactivity with dissolved salts. Even with these emulsifiers the presence of dissolved salts tends to affect the type of emulsion formed.

HODSON (W. E. H.) & BEAUMONT (A.). **Fourth Annual Report of the Department of Plant Pathology for the Year ending September 30th, 1927.**—*Pamp. Seale-Hayne Agric. Coll.*, no. 25, 29 pp. Newton Abbot, Devon, 1928.

Pests of field and vegetable crops occurring in Devon and Cornwall in the year under review included *Contarinia tritici*, Kby., and *Sitodiplosis mosellana*, Géh., on wheat; *Lygus pabulinus*, L., *Eupteryx auratus*, L., and *Empoasca* (*Chlorita*) *viridula*, Fall., on potatoes; *Dasyneura trifolii*, Lw., which caused considerable injury to white clover [*Trifolium repens*] near Plymouth; *Aphis rumicis*, L., *Atomaria linearis*, Steph., *Cassida vittata*, Vill., and *C. flaveola*, Thunb., on mangel, and *Chaetocnema* (*Plectroscelis*) *concinna*, Mshm., on mangel and sugar beet; *Phyllotreta nemorum*, L., which caused serious injury to marrow-stem kale; *Phorbia* (*Chortophila*) *brassicae*, Bch., which destroyed many acres of crucifers, including brussels sprouts, broccoli and field cabbage; and *Psila rosae*, F., which was very injurious to carrots.

Raspberries and loganberries were damaged by *Byturus tomentosus*, F., and *Incurvaria rubiella*, Bjerk., and apples by *Scolytus rugulosus*, Ratz., *Anisopteryx aescularia*, Schiff., *Malacosoma neustria*, L., and the Aphids, *Anuraphis roseus*, Baker, *A. crataegi*, Kalt., and *Aphis pomi*, DeG. Other important fruit pests were *Paratetranychus pilosus*, C. & F., on plum, *Saissetia* (*Lecanium*) *hemisphaerica*, Targ., on red currant, and *Cidaria truncata*, Hufn., on strawberry under glass. Strawberries in North Devon were attacked by the millepede, *Blaniulus pulchellus*, Leach, much fruit being rendered useless. *Bryobia praetiosa*, Koch (*nobilis*, Koch) occurred on gooseberry throughout Devon.

Pests of tomatos under glass were: *Trialeurodes vaporariorum*, Westw., which also attacked a number of other plants; *Myzus circum-*

flexus, Buckt., which was introduced into a house on tulip and spread rapidly on tomato ; *Tetranychus telarius*, L., against which naphthalene fumigation was only effective when a high atmospheric humidity was obtained ; *Blaniulus pulchellus*, which is introduced into the houses in manure and bites through the young plants at ground level ; and *Erythroneura* (*Zygina*) *parvula*, Boh. Damage by *B. pulchellus* was reduced by the use of a bran and Paris green bait. *Gracilaria azaleella*, Brants, the range of which is increasing, passed the winter in the pupal stage in the open on azaleas infested under glass and then placed out of doors. *Myzus circumflexus* is assuming importance as a pest of tulip in West Cornwall and also occurs in the Scilly Isles.

The pyrethrum planted in poor soil in a warm situation in 1925 [*R.A.E.*, A, xv, 366] bore a heavy crop of flowers in 1927, the total yield of dried flower heads amounting to 36 lb. on one-fortieth of an acre. One row of plants that received a little manure grew much larger than the rest and produced a heavier crop of flowers.

Comparative tests of two dinitro-cresol washes and a proprietary tar distillate wash were carried out in an apple orchard of young bush trees. The applications were made on 4th February. On 31st May unsprayed trees in the orchard were heavily infested with Aphids, Tortricid larvae and caterpillars of the winter moth [*Cheimatobia brumata*, L.], etc. ; it was estimated that the tar distillate gave 80 per cent. control of Aphids, 50 per cent. of Tortricids and 80 per cent. of caterpillars of the winter moth group, while the corresponding figures for the two dinitro-cresol washes were 90, 60–70 and 60. On 17th August all sprayed trees were very clean and carried a good crop of fruit, while on the unsprayed trees the fruit was shrivelled and dropping and the new wood was distorted by Aphid attack. Vegetables grown under the trees were killed by the spraying.

Details are given of the results of liberations of *Aphelinus mali*, Hald., for the control of *Eriosoma lanigerum*, Hausm., on apple. In two orchards in which the parasite had become well established in 1926 it had almost or entirely disappeared in 1927, apparently as a result of winter spraying, while in a third in which no winter spraying was carried out it passed the winter well and increased throughout the summer.

A list of pests supplementary to those previously noticed [*R.A.E.*, A, xv, 367, etc.] is given. *Tortrix postvittana*, Wlk., was bred from an apple imported from New Zealand.

Report of the Advisory Departments. 1927.—*Pamp. Seale-Hayne Agric. Coll.*, no. 27, 31 pp., 1 chart. Newton Abbot, Devon, 1928.

This report includes a summary of the more important work carried out during the year, most of which is dealt with in greater detail in the preceding paper. A bait of 1 lb. Paris green and 25 lb. bran mixed dry and moistened with water has given excellent results against leather-jackets [*Tipula*], slugs and cutworms. The bait is broadcast over the fields at the rate of 26 lb. to the acre, and the cost, including materials and labour, is only about 6*s.* 6*d.* per acre. Applications made from February to April were more successful in controlling leather-jackets than those made in December and January, probably owing to the greater activity of the larvae in the spring.

WILSON (G. F.). **Nicotine as an Insecticide.**—*Chemist & Druggist*, 1928, pp. 423–424. London, 31st March 1928.

This is a general account of the value of nicotine as an insecticide. Its application in various forms, such as contact washes, dusts or fumigants and in combination with other sprays, is discussed, and the precautions needed as regards plants and animals are pointed out. The formula recommended as a spray consists of 7½ oz. nicotine (95–98 per cent.), 10 lb. soft soap (potash) or 2 oz. saponin, and 100 gals. water. This is most satisfactory against sucking insects ; for young caterpillars the nicotine may be increased to 10 oz.

BARNES (H. F.). **British Gall Midges. ii.** *Lestodiplosis* **Kieffer.**—*Ent. Mo. Mag.*, lxiv, pp. 68–75 & 142–148, 5 figs., 1 ref. London, March, April, June & July, 1928.

The following is the author's summary of this paper : Twenty-four new species of *Lestodiplosis*, Kieff., have been described. Several of these may be of economic importance in holding in check outbreaks of injurious midges. For example, *L. pyri*, sp. n., lives in its larval stage at the expense of *Dasyneura pyri*, Bch., *L. pisi*, sp. n., lives on the larvae of *Contarinia pisi*, Winn., *L. trifolii*, sp. n., attacks *D. trifolii*, F. Lw., and *L. hordei*, sp. n., attacks *Colomyia hordei*, Barnes. Others of the genus attack beneficial midges ; for example, *L. cirsii*, *L. lanceolatae* and *L. acanthoidis*, spp. n., whose larvae feed on midge larvae that help in diminishing the number of potential thistle seeds : and two species, *L. pini* and *L. macrorosae*, spp. n., are thought to feed on other gall-midges that attack Aphids.

PETHERBRIDGE (F. R.) & THORPE (W. H.). **Notes on the Capsid Bugs found on Species of** *Ribes*.—*Ent. Mo. Mag.*, lxiv, pp. 109–113, 2 refs. London, May 1928.

During 1926 and 1927 a survey was made of the damage caused to currants and gooseberries in the Eastern Counties of England by various Capsid bugs. Of the fifteen species recorded, *Lygus pabulinus*, L., appears to cause most damage. *Plesiocoris rugicollis*, Fall., was the chief pest in some plantations. Notes are given on the food-plants of the other species ; although these were taken on currants and sometimes also gooseberries and some were successfully reared on currants, no appreciable damage was done by any of them.

COLLIN (J. E.). **A new Species of** *Hydrellia* **(Diptera, Ephydridae) mining the Stems of Water-cress.**—*Ent. Mo. Mag.*, lxiv, pp. 128–129, 2 refs. London, June 1928.

TAYLOR (T. H.). **The Watercress Stem-miner.**—*T.c.*, pp. 126–128, 1 pl., 1 fig.

In the first paper *Hydrellia nasturtii*, sp. n., is described from specimens reared from larvae mining in the stems of watercress (*Nasturtium officinale*). This fly is closely related to *H. incana*, Stenh., and is undoubtedly the species recorded by Marchal as *H. ranunculi*, Hal., in France.

In the second paper the larva and mine of the new species are described. Pupation takes place in the larval burrow.

Theobald (F. V.). **Some West Indian Aphididae.**—*Ent. Mo. Mag.*, lxiv, p. 153. London, July 1928.

The species recorded are : *Aphis gossypii*, Glov., on *Ipomoea*, *Anona*, okra (*Hibiscus*), etc. ; *A. nerii*, Boy., on oleander ; *A. maidis*, Fitch, on maize ; *A. illinoisensis*, Shimer, on grapes ; *Toxoptera aurantii*, Boy. (*aurantiae*, Koch) on cacao flowers and *Anona* ; *Myzus persicae*, Sulz., on cabbage ; *Idiopterus brasiliensis*, Moreira, on Barbados beans ; and *Cerataphis lataniae*, Boisd., on raffia palms.

Theobald (F. V.). **Notes on Hop Insects in 1927.**—*Entomologist*, lxi, no. 781, pp. 121–122. London, June 1928.

The following pests were recorded from hops in various parts of England in 1927 : *Gortyna* (*Hydroecia*) *micacea*, Esp., which was taken from hops for the first time, the moths emerging in August from damaged tops of hop bine received in May, the bine being killed by the tunnelling of the larvae ; *Acronycta rumicis*, L., which was more abundant than usual and caused considerable defoliation ; *Dasychira pudibunda*, L., which was less numerous than usual ; *Polygonia c-album*, L. ; *Contarinia humuli*, Tölg (strig maggot), from three counties, in one of which a considerable proportion of the cones was damaged ; *Agromyza frontalis*, Mg., which occurred in some numbers in two counties, but never became of great importance ; *Macrosiphum gei*, Koch, which attacks young bine, but leaves the hops in early June, so that the damage was not lasting ; *Phorodon humuli*, Schr. (hop-plum aphis), which was as abundant as usual, but was easily controlled ; *Calocoris norvegicus*, Gmel. (*bipunctatus*, F.) ; *C. fulvomaculatus*, DeG. (needle-nosed hop bug), which caused considerable damage and is recorded from one garden where it had not previously been seen, and into which it was probably introduced on hop poles from infested gardens ; *Oncotylus viridiflavus*, Goeze ; *Euacanthus interruptus*, L. ; and *Psylliodes attenuata*, Koch, which was present on nettles in large numbers after the hops had been picked and the bine was dying back, apparently hibernating on this plant, which it may leave for the hops in early April.

Laing (F.). **A Note on two Parasites of** *Lyctus parallelopipedus* **Mel.**—*Entomologist*, lxi, no. 782, pp. 163–164. London, July 1928.

The Bethylid, *Sclerodermus macrogaster*, Ashm., and the Braconid, *Monolexis lycti*, Cress., have been reared from samples of recently imported American ash infested by the larvae of *Lyctus parallelopipedus*, Melsh. *S. macrogaster* has previously only been reared from Cerambycid larvae. A predacious Clerid, *Tarsostenus univittatus*, Rossi, emerged from the same material.

Paillot (A.). **Sur les propriétés insecticides de l'arséniate de calcium.**—*C.R. Acad. Agric. Fr.*, xiv, no. 12–13, pp. 502–506. Paris, 1928.

Experiments with thirty samples of various brands of commercial tri-calcic calcium arsenate showed that the toxicity of these products to *Pieris brassicae*, L., varies considerably and that their insecticidal value is to a certain extent independent of the quantity of arsenic present and cannot be determined by chemical composition alone. The presence of impurities in the form of mono- and di-calcic arsenates and of arsenites is not sufficient to account for the differences in toxicity in all cases, since these were apparent when the amount of impurities was negligible. The details of the technique employed are given.

Barbey (A.). **La fidonie du pin dans les pineraies d'Alsace et de Lorraine.**—*Rev. Eaux et Forêts,* December 1926, reprint, 7 pp., 6 pls., 1 ref. Paris, 1927.

The pine moth, *Bupalus piniarius,* L., has seldom been mentioned in French forest literature, though it is a well-known pest in some of the forest areas in Germany. It has recently caused serious damage in Alsace and Lorraine, where the half-century under German régime has resulted in a considerable modification of the character of the stands and the introduction of fresh plantations of pine and spruce in the place of deciduous trees. The first moths of the present invasion were observed near Strasburg in 1924. The adults are in flight in June, and the females deposit from 3 to 15 eggs on the lower surface of pine needles, which are attacked by the young larvae while they are still tender and in course of development. In September the larvae become full-grown and eat voraciously, causing the destruction and dropping of far more needles than they actually devour. With the first frosts, about the beginning of November, the larvae drop to the ground by threads and pupation takes place without a cocoon in the leaf mould under the trees. The invasion in question was confined to the Strasburg and Metz areas, and at its maximum had killed the pines from 20 to 80 years old over an area of more than 1,000 acres, while those over a further 3,000 to 4,000 acres were badly attacked. Among the dying trees on the former area, secondary pests, such as *Myelophilus piniperda,* L., and *M. minor,* Htg., invaded the trunks, while on the dead trees these were followed by such other insects as the weevil, *Pissodes pini,* L., and the Longicorn, *Rhagium inquisitor,* L. Although *B. piniarius* is essentially confined to pines, it was occasionally found attacking spruce in the vicinity when the supply of pines was insufficient. It was generally found that trees of medium height (about 30 to 70 years old) were preferred, the older and taller trees probably being avoided instinctively owing to the difficulty experienced by the larvae in descending to the ground in case of sudden cold or bad weather. In the vicinity of villages and on areas bare of undergrowth, pigs were of great use in clearing the pupae from the leaf mould, and in some localities wild boars occur and are equally useful. Parasites of the larvae that destroyed from one-fifth to one-third of the numbers present in February 1926 were the Ichneumonids, *Heteropelma calcator,* Wesm., and *Ichneumon nigritarius,* Grav., and the Tachinid, *Lydella nigripes,* Fall.

Barbey (A.). **La fidonie du pin combattue à l'aide de l'avion.**—*Rev. Eaux et Forêts,* March 1927, reprint, 3 pp., 2 pls., 1 ref. Paris, 1927.

In view of the serious infestation of the forests of Alsace and Lorraine by the pine moth [*Bupalus pinarius,* L.] [see preceding paper], it was decided to attempt its control by dusting from aeroplanes [*cf. R.A.E.,* A, xv, 116]. The necessary modifications to the biplane carrying the poison are described. On two consecutive days in October 1926 eight flights were made, distributing a total of 1¼ tons of calcium arsenate over about 123 acres, from a height varying from 10 to 50 feet. This dusting is most effective if carried out in early morning in summer or in misty autumn weather, when the foliage is covered with a fine dew. The larvae show signs of paralysis three days after the application and die on the fifth day. It cannot as yet be definitely stated whether birds and game might not be injured by this treatment ; the noise of the aeroplane and the guards stationed around the forest to warn people from approaching are sufficient to drive them away at the time of the applications, and after it is over but little of the powder reaches the undergrowth ; moreover, the strength of the arsenic is scarcely sufficient to cause serious damage in this respect. The test was unfortunately spoiled to a great extent by exceedingly heavy rain, which fell from the time of the second flight for 48 consecutive hours, so that most of the needles were washed clean of arsenic before the larvae had time to eat the poison ; even so, however, more than one-third were killed. The measure, in spite of being a preliminary trial, cost only about 28*s*. per acre, an expenditure that is justified by the value of the pine stand. It seems evident that *B. piniarius* and other Lepidopterous pine pests can be successfully destroyed by aeroplane dusting, provided that the meteorological conditions are suitable and that the treatment is given, if possible, before the larvae are fully grown. The composition of the insecticidal powder and the possibility of reducing its price of manufacture should be studied further.

MAYNÉ (R.). **Insectes nuisibles aux palmiers de l'Afrique tropicale et appartenant à la famille des Dynastides.**—*Ann. Gembloux*, xxxiv, pt. 3, pp. 89–105, 10 figs., 1 ref. Brussels, March 1928.

Several Dynastids of the genera *Oryctes* and *Archon* attack coconut and other palms in Tropical Africa. The most common and most injurious are *O. monoceros*, Oliv., *O. boas*, F., *O. owariensis*, P. de B., *O. rhinoceros*, L., an East Indian species that also occurs in East Africa, and *A. centaurus*, Burm. These beetles are briefly described, and notes are given on their biology and geographical distribution, with a list of all the African species.

The usual remedial measures are briefly outlined ; these consist of preventive measures such as clean cultivation, the use of trap heaps of débris to attract the ovipositing females, and the destruction of the adults in their galleries by means of a wire.

Agricultural Experimental Work in R.S.F.S.R. 1917-1927. [*In Russian.*]—320 pp. Leningrad, Gosudarst. Inst. Opuit. Agron. [State Inst. Exptl. Agron.], 1928.

In the course of this report a chapter is devoted to agricultural entomology. The past and present situation in Russia is briefly reviewed, and the work done by various organisations is discussed.

[MAKHNOVSKIĬ (P. L.).] **Махновский (П. Л.). A mechanical Means of applying Paradichlorobenzene.** [*In Russian.*]—*Vest. Vinodel. Ukrainui*, xxix, no. 3, pp. 170–171, 1 fig. Odessa, March 1928.

This simple device for applying paradichlorobenzene to the soil consists of a metal tube with a close fitting wooden core that is pointed at the lower end to facilitate its insertion into the soil. When the instrument is in the soil, the wooden core is removed and the paradichlorobenzene is poured into the hollow tube. The depth of the application may be regulated by a bracket attached to the iron tube by means of an adjustable clamp. This method of application is much quicker than the usual one of removing the soil with a spade, and still more time may be saved by carrying the paradichlorobenzene crystals in a bag that has a long sleeve with a metal attachment through which the crystals are poured and by means of which the dose may be automatically regulated.

[PLOTNIKOV (V. I.).] **Плотников (В. И.). Pests and Diseases of Cotton in Central Asia.** [*In Russian.*]—41 pp., 49 figs. Tashkent, Uzkhlopkom, 1928.

A brief account is given of the pests attacking cotton in Central Asia with notes on their habits and recommendations for their control. The less well known pests include *Trifidaphis perniciosa*, Nevskiĭ, which attacks the roots of the young plants, sometimes killing them ; cotton should not be sown after potatoes or tomatos, as this Aphid attacks these plants and also a number of weeds.

[VORONTZOVSKIĬ (P. A.).] **Воронцовский (П. А.). Materials for the Knowledge of the Acridodea of the Orenburg Region.** [*In Russian.*]—*Izv. Orenburgsk. Stantz. Zashch. Rast.* [*Bull. Orenburg Plant Prot. Sta.*], pt. 1, pp. 5–25, 6 refs. Orenburg, 1928.

This is a list of the species with phenological and ecological data. The males of various species usually become adult a few days earlier than the females.

[KUZNETZOV (N. P.).] **Кузнецов (Н. П.). An Experiment in dry dusting with Arsenicals with an Admixture of other Substances for the Control of Acridodea in the Novo-Pokrovsk Section, Orsk District, Orenburg Government from 30th June to 4th July 1927.** [*In Russian.*]—*Izv. Orenburgsk. Stantz. Zashch. Rast.* [*Bull. Orenburg Plant. Prot. Sta.*], pt. 1, pp. 47–58. Orenburg, 1928.

In the area under experiment 24 species of grasshoppers occurred, *Chorthippus* (*Stauroderus*) *scalaris*, F.W., predominating (65 per cent.). Wheat flour, dust from flour mills, whitewash and wood ashes were tested as carriers for the arsenicals. The best results were obtained with one part arsenic (As_2O_3) to two parts of flour ; one part of calcium arsenite ($2CaHAsO_3+H_2O$) to three parts of flour ; one part of sodium arsenite (Na_2HAsO_3) to five parts of mill dust ; one part of sodium arsenite to four parts of mill dust ; and three parts of calcium arsenite to ten parts of ash. The results require confirmation since they were somewhat affected by rain and 99 per cent. of the grasshoppers were already adult.

[Kuznetzov (N. P.).] **Кузнецов (Н. П.). The Use of the Dust from Flour Mills as a Bait Material in the Control of Acridodea.** [*In Russian.*]—*Izv. Orenburgsk. Stantz. Zashch. Rast.* [*Bull. Orenburg Plant Prot. Sta.*], pt. 1, p. 59. Orenburg, 1928.

The dust from flour mills in a mixture of equal parts of the dust and of dry dung proved to be very suitable for poison baits against grasshoppers ; these baits were used in the Orsk district in 1927 on a large scale, with good results.

[Vorontzovskii (P. A.).] **Воронцовский (П. А.). New Cases of Parasitism in Acrididae.** [*In Russian.*]—*Izv. Orenburgsk. Stantz. Zashch. Rast.* [*Bull. Orenburg Plant Prot. Sta.*], pt. 1, p. 60. Orenburg, 1928.

Anthrax maurus, L., is recorded as having been bred from the egg-pods of *Dociostaurus kraussi*, Ingen., and *Sarcophaga lineata*, Fall., from the adults of *D. brevicollis*, Ev., and *D. albicornis*, Ev.

Needham (J. G.), Frost (S. W.) & Tothill (B. H.). **Leaf-mining Insects.** —Med. 8vo, viii+351 pp., 3 pls., 91 figs. Baltimore, Md., The Williams & Wilkins Co. ; London, Baillière, Tindall & Cox ; 1928. Price 27*s*. 9*d*. (Postage abroad, 5*d*. extra.)

This volume represents an endeavour to make accessible in convenient form the extensive, though hitherto widely scattered, data in this ecological field. The first two chapters give the reader a general acquaintance with leaf-mining insects, the actual mines, and the extent of the mining habit, and include a table for separating the larvae of leaf-mining Lepidoptera, Coleoptera, Hymenoptera and Diptera. The twelve succeeding chapters, of which nine are devoted to the Lepidoptera, deal with the insects themselves ; the egg, larva, pupa and adult of representative members, mainly North American, of each group are described, as well as the character of the mining operations and the adaptations to the mining habit. Useful lists of North American leaf-miners and of their food-plants and a classified bibliography complete the book. Though comparatively few leaf-miners are of economic importance, the information on the individual characteristics of the mines and the identification of the insects should prove of value to the economic entomologist.

Mason (A. F.). **Spraying, Dusting and Fumigating of Plants. A Popular Handbook on Crop Protection.**—Large Cr. 8vo, xxxi+539 pp., 237 figs. New York, The Macmillan Co., 1928. Price 21*s*. net.

To the rapid spread of the San José scale, more than to any other single factor, the author ascribes the very noticeable progress during recent years in the methods of plant protection, and he has here condensed the latest information on the methods, machinery and principles involved in combating agricultural pests and diseases. Two chapters, on the history of spraying and the principles underlying spraying practice, are followed by three dealing with the materials used, three on spraying machinery and plant, and one each devoted to the technique of spraying, dusts and dusting, fumigation, soil sterilisation, and the diagnosis of orchard and garden injury. The latter half of the book comprises twenty-five chapters arranged under crop headings (including chapters on seed treatment and garden pests), each presenting keys for diagnosing the injury, followed by brief notes on the pests themselves and recommendations for their control, and concluding with a spraying and dusting schedule for the crop concerned. A useful spray dilution table, for amounts ranging from 200 gals. down to 1 qt., is appended.

GREEN (E. L.). **Lubricating Oils as Insecticides in dormant Spraying.**—*Indust. & Engng. Chem.*, xix, no. 8, pp. 931–935. 1927. (Abstract in *Expt. Sta. Record*, lviii, no. 4, pp. 346–347. Washington, D.C., 1928.)

This paper is a report on a series of lubricating oils selected to represent the range of available oils tested as sprays for San José scale [*Aspidiotus perniciosus*, Comst.] and leaf-rollers [*Tortrix argyrospila*, Wlk.] in 1925 and 1926, part of which has already been noticed [*R.A.E.*, A, xiv, 270]. The toxicity of the oils studied does not appear to be related to their viscosity. The presence of significant quantities of vapour or vapour pressure is doubtful, in view of the low field temperatures and the high boiling ranges of effective oils. Oils for this purpose may be from asphalt or paraffin base crude without prejudice to the effects. Oils that have been subjected to processes for completely removing the colour are likely to be more effective than before the decolourising treatment.

JACKSON (L. E.) & WASSELL (H. E.). **[Moth-proofing textile Materials.]**—*Indust. & Engng. Chem.*, xix, pp. 1175–1180. 1927. (Abstract in *Summ. Curr. Lit. Brit. Cotton Ind. Res. Assoc.*, vii, no. 27, p. K127. Manchester, 1927.)

A comprehensive investigation of possible moth-proofing chemicals has shown that the cinchona alkaloids and their derivatives are particularly effective, and it is possible to use one or more of these substances under almost any condition encountered in the production and use of materials susceptible to moth attack. For the past year a process has been successfully applied commercially in the dry cleaning and dyeing industry in which materials to be moth-proofed are treated by immersion or by spraying, with solutions of cinchona alkaloids or their compounds in water or petroleum naphtha.

NEWCOMER (E. J.) & YOTHERS (M. A.). **Experiments for the Control of the European Red Mite and other Fruit-tree Mites.**—*Tech. Bull. U.S. Dept. Agric.*, no. 25, 33 pp., 5 figs., 6 refs. Washington, D.C., November 1927.

This paper gives an account of laboratory and orchard tests of various sprays carried out in 1923, 1924 and 1925 in the western United States, where the commonest mites attacking fruit-trees are *Paratetranychus pilosus*, C. & F. (European red mite), *Bryobia praetiosa*, Koch (brown mite) and *Tetranychus bimaculatus*, Harvey (common red spider). Lime-sulphur used as a dormant spray proved to be of little value for the destruction of winter eggs of *P. pilosus* or *B. praetiosa*, while lubricating oil emulsions and miscible oils at dilutions of 2, 3 and 4 per cent. of oil destroyed 95 per cent. of the eggs in most cases. Better results were secured in orchard tests with a 3 per cent. than with a

2 per cent. oil spray. About seven times as many mites were present in 1924 on the plot sprayed with lime-sulphur as on any of the oil-sprayed plots. Laboratory tests with summer eggs showed that sulphur sprays and dusts are ineffectual in controlling *P. pilosus*, though sulphur dust (89 per cent.) controlled *T. bimaculatus* in a single test. Lime-sulphur (32° Baumé) at summer strength (1 : 50), which, although fatal to the mites, killed very few eggs, gave good control at the time of the pink and calyx sprays when practically no eggs were present on the trees, but the effect of later applications was not nearly so lasting as that of oil sprays. A series of tests with lubricating oil sprays against *P. pilosus* used at dilutions of 0·5 or 0·67 per cent. of oil showed these to be superior to lime-sulphur, killing almost 100 per cent. of the mites and the majority of the summer eggs. Miscible oils and oil sprays containing cresol did not give such good results as oil emulsions containing none. A combination of weak lime-sulphur and oil spray, though successful in controlling the mites, is of no practical use as it causes severe scorching of the foliage. The addition of lead arsenate or of soap or casein as a spreader produced poorer results than oil sprays alone, though the reduction in the effectiveness of the spray is not sufficient to be of consequence if there is some other reason for adding these materials. The only one of the miscellaneous sprays tested that gave satisfactory results was potash fish-oil soap, which, used at the rate of 2 lb. to 50 U.S. gals., killed 90–99 per cent. of the mites and would be useful for spraying tender foliage that might be injured by oil sprays. Nicotine sulphate, 1 : 800, with casein-lime as a spreader killed less than 50 per cent. of the mites, but mixed with potash fish-oil soap was very effective ; since the soap kills most of the mites, it is not necessary to use the nicotine unless Aphids are also present. Examination of many trees sprayed with power sprayers showed that danger of injury is very slight from the use of dormant sprays of lime-sulphur or oil if used before the fruit buds separate, though if these are applied later some dropping of fruit buds may follow. No appreciable damage was caused by any of the sulphur sprays, except lime-sulphur, which scorched some of the leaves and spotted a few apples exposed to hot sun, and soluble sulphur, which produced severe leaf scorching. The addition of weak lime-sulphur to summer oil spray scorched the foliage severely, while the nicotine and soap sprays cause no damage whatever. Lubricating oil sprays used at strengths of 0·5 or 0·67 per cent. of oil on trees in leaf caused no appreciable injury to apple, pear, prune or cherry if the oils were thoroughly emulsified. Free oil spots fruit and foliage of any variety, a small quantity in the spray tank scorching wherever it hits, and the fruit being sometimes pitted with sunken brown spots, which may, however, disappear by the time it is harvested. Summer oil sprays should not be used on peach trees, as the foliage invariably becomes spotted. Emulsions made of crystal oil appear to cause less injury than those composed of brown neutral or red engine oils. The formulae, compositions or properties of the 21 sprays and materials used are given.

Selkregg (E. R.) & Siegler (E. H.). **Life History of the Codling Moth in Delaware.**—*Tech. Bull. U.S. Dept. Agric.*, no. 42, 60 pp., 35 figs. Washington, D.C., January 1928.

A detailed account is given of the seasonal history of the codling moth, *Cydia* (*Carpocapsa*) *pomonella*, L., in Delaware, where it was the object of exhaustive studies during 1919 and 1920. In this locality, which is considered fairly representative of the middle Atlantic States, two complete generations and a partial third occur in a year. The development of the different stages and the average oviposition records are shown in a series of tables. Predacious enemies are not sufficiently important to have any effect on the numbers of the moth, though the beetle, *Tenebroides corticalis*, Melsh., was occasionally found beneath bands feeding on the larvae. Three Braconid parasites, *Ascogaster carpocapsae*, Vier., *Bassus carpocapsae*, Cush., and *Phanerotoma tibialis*, Hald., were frequently present in numbers, particularly the first, and three or four other species occurred in small numbers. A fungus of the genus *Hirsutella* destroyed a few of the hibernating larvae and some were killed by a wilt disease. It was observed that the adult moths mainly emerged between noon and 6 p.m.

ESSIG (E. O.). **Rice Bugs.**—*Pan-Pacific Ent.*, iv, no. 3, p. 128. San Francisco, Cal., January 1928.

There have recently been numerous reports of insects that appear in the rice fields in Mexico when the grain heads are beginning to form and feed on the kernels, causing deformation and spotting. Two of the species concerned have been identified as the Pentatomids, *Solubea insularis*, Stål, and *Mormidea prominula*, Dall.

SMITH (L. M.). **Distinction between three Species of** *Eumerus* **(Syrphidae, Diptera), with Description of a new Species.**—*Pan-Pacific Ent.*, iv, no. 3, pp. 137–139, 9 figs. San Francisco, Cal., January 1928.

In almost all cases all specimens of *Eumerus* in America have been taken to be *E. strigatus*, Fall., and notes on the occurrence and damage have been published under this name. *E. tuberculatus*, Rond., has, however, also been reported as attacking bulbs [*R.A.E.*, A, viii, 332]. In the study of flies believed to be *E. strigatus*, it became apparent that two other species were present, one of which was identified as *E. tuberculatus*, while the other is here described as *E. narcissi*, sp. n. Descriptions are here given of all three species, but the author has so far been unable to distinguish the females of the species, all of which very closely resemble one another.

WYMORE (F. H.). **On** *Dinapate wrighti* **Horn.**—*Pan-Pacific Ent.*, iv, no. 3, p. 143. San Francisco, Cal., January 1928.

It was previously thought that the attack of *Dinapate wrighti*, Horn (California palm borer) was confined to the trunks of dead California fan palm [*Washingtonia filamentosa*]. It has, however, now been found that at least 90 per cent. of the transplanted fan palms, even those transplanted 35–40 years ago, are injured by the burrowing of this beetle in the growing tips; the burrows made are from $\frac{5}{8}$ to $\frac{7}{8}$ in. deep, and the injury takes the form of large masses of fibrous frass near the growing tip and elongate holes in the leaf petioles. In the locality under discussion, the main flight of the beetle occurred in the first half of July, although some individuals were active as early as 15th June and others were found as late as the end of August.

Smith (H. S.) & Compere (H.). **A preliminary Report on the Insect Parasites of the Black Scale,** *Saissetia oleae* **(Bern.).**—*Univ. Calif. Pub. Ent.*, iv, no. 9, pp. 231–334, 63 figs., refs. Berkeley, Cal., 9th March 1928.

Saissetia oleae, Bern. (black scale), which is the most serious pest of *Citrus* in southern California and is an important pest of olives in the northern part of the State, occurs in almost all parts of the world in which climatic conditions are suitable for these and similar subtropical fruits. More than fifty Chalcidoid parasites and hyperparasites of *S. oleae*, including several undescribed species, are known; thirty-six of these are dealt with individually in the present paper, systematic and biological notes and in many cases descriptions of the adults and immature stages being given.

The species definitely known to be primary parasites of *S. oleae* are *Anysis saissetiae*, Ashm., introduced into California from China; *Euaphycus luteolus*, Timb., a Californian species; *Tomocera californica*, How., which is probably an Australian species that entered California at the same time as *S. oleae*; *Scutellista cyanea*, Motsch., which occurs in many parts of the world, and *Metaphycus lounsburyi*, How., both of which were introduced from South Africa; *Lecaniobius cockerelli*, Ashm., which occurs in many parts of the neotropical region and was introduced from Barbados, but failed to become established; *Coccophagus lecanii*, Fitch, which occurs throughout the United States; *C. lunulatus*, How., which is generally distributed but of minor importance in California; *C. trifasciatus*, Comp., and *C. modestus*, Silv., introduced from South Africa; *C. anthracinus*, Comp., which was also introduced from South Africa and liberated in large numbers, but has not been recovered in the field; and *C. yoshidae*, Nakayama, a Japanese species. Detailed accounts are given of the immature stages and biology of *Metaphycus lounsburyi* and *Scutellista cyanea*, which are the most important parasites of *S. oleae* in California. Species presumed, with more or less certainty, to be primary parasites of *S. oleae* are *Coccophagus ochraceus*, How., in South Africa and California; *C. longifasciatus*, How., in the United States, South Africa, China and Ceylon; *C. saintebeauvei*, Gir., in Uganda; *C. nubes*, Comp., sp. n., *C. rusti*, Comp., sp. n., and *Metaphycus natalensis*, Comp., sp. n., which are described from Natal; *Aneristus ceroplastae*, How., in various parts of the tropics; *A. oculatipennis*, Gir., in Peru; and *Euaphycus helvolus*, Comp.

The species definitely known to be hyperparasites of *S. oleae* are *Eupelmus inyoensis*, Gir., *Tetrastichus blepyri*, Ashm., *Thysanus niger*, Ashm., *Cheiloneurus inimicus*, Comp., *Eusemion californicum*, Comp., and *Quaylea whittieri*, Gir., all of which attack *Metaphycus lounsburyi* in California, the last two being the most important in this respect; and *Tetrastichus injuriosus*, Comp., in South Africa. *Quaylea whittieri*, which was introduced from Australia in 1900 under the impression that it was a primary parasite of *Saissetia oleae*, first attacked *Scutellista cyanea* and *Tomocera californica*, but subsequently increased enormously on *Metaphycus lounsburyi* when this species became established in southern California in 1919; it is considered that *S. oleae* would be controlled in the coastal areas where it has overlapping generations if *Q. whittieri* did not occur there.

Species dealt with that are believed to be hyperparasites of *S. oleae* are *Euxanthellus* sp. and *E. subochraceus*, How., from South Africa; and *Cheiloneurus lineascapus*, Gah., *C. noxius*, Comp., and *Marietta* *mexicana*, How., from California. The relation of the parasite to *S. oleae* is unknown in the case of *Aphobetoideus comperei*, Ashm., and *Myiocnema comperei*, Ashm., from New South Wales, and *Baeoanusia africana*, Gir., from the Cape Province.

The possibilities of controlling *S. oleae* in California are still far from being exhausted, and in only a small part of the known range of the scale have its parasites been studied. In view of the great importance of this pest, which costs the citrus industry in the State £400,000 to £600,000 a year, and the increasing difficulty of controlling it by fumigation, investigations of the parasites should be continued.

WOLCOTT (G. N.). **The May Beetles of Haiti (Scarabaeidae : Coleoptera).**—*Proc. Ent. Soc. Washington*, xxx, no. 2, pp. 21–29, 5 figs., 3 refs. Washington, D.C., 24th March 1928.

The May beetles of the genus *Lachnosterna* (*Phyllophaga*) and their larvae, the white grubs, are of very little economic importance in the island of San Domingo, and the author has only observed a few instances of injury by them in the Republic of Haiti. Sugar-cane is comparatively little grown in Haiti, and white grubs [*L. hogardi*, Blanch.] have only been found doing damage in a few fields. This is in striking contrast to the conditions in Porto Rico, where white grubs are the most important insect pests of most crops. Seven species of *Lachnosterna* are known to occur in Haiti ; five are here described as new, and the other two are redescribed.

DOZIER (H. L.). **Two undescribed Aphelinid Scale Parasites from Delaware (Aphelinidae : Hymenoptera).**—*Proc. Ent. Soc. Washington*, xxx, no. 2, pp. 35–38, 2 figs. Washington, D.C., 24th March 1928.

The two new parasites described are *Prospaltella forbesi*, from *Aspidiotus forbesi*, Johns., on apple, and *Azotus americanus*, from branches of *Sorbaria stellipila* heavily infested with *Aspidiotus perniciosus*, Comst., from which large numbers of *Prospaltella perniciosi*, Tower, were bred. *Azotus americanus*, which is the first species of the genus to be recorded from the New World, may therefore be either a parasite of *A. perniciosus* or two other Coccids that were present in small numbers, or a hyperparasite.

HOUGH (W. S.). **A Study of the Biology and Control of the Red-banded Leaf-roller.**—*Bull. Virginia Agric. Expt. Sta.*, no. 259, 29 pp., 6 figs., 3 refs. Blacksburg, Va., December 1927.

The larvae of *Eulia* (*Argyrotaenia*) *velutinana*, Wlk. (red-banded leaf-roller) attack the skin of fruit, particularly apples, causing a superficial scar that reduces its value. More than 60 food-plants of this Tortricid are known, on 14 of which it has been found in Virginia, apple being preferred, although peaches are occasionally attacked. All stages are briefly described, and the distribution is discussed. The young larvae begin feeding in May on the lower surface of the leaves, and they confine their attack to the foliage until August or September, when the majority begin to feed on the fruit. Hibernation takes place in the pupal stage, most of the pupae being found among dead leaves beneath the trees. The first adults emerge as soon as the green tips show in the apple buds, and the first larvae hatch while the apple trees are blossoming. The second generation hatches in late June and July, and the third in August and September; in 1925 some of the larvae of the third generation produced moths in the same season and these oviposited in September. Insectary studies made from 1924 to 1927 showed the average length of the life-cycle (egg to egg) to be 64·6 days for the first generation and 45·7 days for the second, the third being incomplete. The average longevity of the adults was 7–12 days, the females usually living slightly longer than the males. The average number of eggs deposited by one female varied from 47 to 122, the eggs being laid in masses containing on an average 34 eggs in breeding cages and 40·8 eggs on orchard trees. The moths, therefore, usually deposited more than one mass of eggs.

A list of 19 parasites of *E. velutinana* is given, 7 of which were reared in the course of these studies, *viz.*, *Epirhyssalus atriceps*, Ashm., and *Glypta vulgaris*, Cress., which were the most common, *Dioctes obliteratus*, Cress., *Phytodietus annulatus*, Prov., *Triclistus curvator*, Ashm., *Elachertus cacoeciae*, How., and *Goniozus euliae*, Fouts; the last four species have not previously been recorded as parasites of *E. velutinana*. Though parasitism did not appear greatly to reduce the amount of injury caused by the first generation, it resulted in a marked reduction of the second. Parasitism of the larvae, which was common in September and October, helped to reduce the numbers of over-wintering pupae. Laboratory experiments with larvae of *E. velutinana* showed that the percentage of mortality secured by spraying with lead arsenate was higher when the larvae were young and when thorough applications were made to both sides of the leaves, but that there was no clear correlation between mortality and the amount of lead arsenate in excess of 3 lb. to 100 U.S. gals. water. Tests of spraying equipment showed that drive spray-nozzle combinations were best suited to produce an effective spray covering on both sides of the foliage in all parts of the tree under average orchard conditions. Leaf-roller injury was reduced to less than 1 per cent. in orchards sprayed three times with lead arsenate according to the regular schedule in May and June, while unsprayed trees had from 3·4 to 6·8 per cent. of the fruit injured. The application of four sprays is recommended for Virginia orchards, a petal-fall spray and the others 3, 5 and 7 weeks later.

HOUGH (W. S.). **Orchard Spraying and Spray Equipment.**—*Bull. Virginia Agric. Expt. Sta.*, no. 260, 12 pp., 3 figs. Blacksburg, Va., February 1928.

This paper gives the practical results of four years' investigations of spraying and spray equipment in Virginia, indicating that efficiency in spraying depends on the personnel, adequate pump capacity, the condition in which the sprayer is kept, and the suitability of the equipment for the machine used. Experiments were made to determine the amount of liquid required to spray trees of various sizes; the suitable speed of spraying in relation to the capacity of the machines used and the size of the orchard; the relative merits of the rod fitted with nozzles and the spray gun; the correct pressure and volume of spray; and the best types of hose and nozzles.

Poos (F. W.) & Weigel (C. A.). **The Bulb Flies of Narcissus with Special Reference to the Bulb Industry in Virginia.**—*Bull. Virginia Truck Expt. Sta.*, no. 60, pp. 571–594, 3 figs., 52 refs. Norfolk, Va., 1st July 1927.

The expansion in the narcissus bulb industry in Virginia during the past few years and the fact that some of the planting stock imported before the placing of restrictions was infested with bulb pests has increased the risk of these becoming established. This information on the life-history and habits of *Merodon equestris*, F. (narcissus bulb fly) and *Eumerus strigatus*, Fall. (lesser bulb fly) has been collated from previous work [*R.A.E.*, A, xiv, 654; xv, 255; etc.]. During 1926, experiments were started in Virginia to ascertain the effect of hot-water treatment, in which the bulbs are immersed for 1–3 hours in water heated to 110–111·5° F., on the vegetative qualities of the bulbs and their subsequent development. It does not appear that this treatment will limit production in Virginia, as in no case were appreciable ill effects produced.

Poos (F. W.) & Peters (H. S.). **The Potato Tuber Worm.**—*Bull. Virginia Truck Expt. Sta.*, no. 61, pp. 597–630, 3 figs., 11 refs. Norfolk, Va., 1st October 1927.

Phthorimaea operculella, Zell. (potato tuber moth) increased in abundance in certain parts of Virginia during 1927. A detailed account is given of the life-history of this pest [*cf. R.A.E.*, A, xiv, 471]. The infestation in 1927 was directly traceable to fields containing heavily infested self-sown potato plants in the autumn of 1926. The numbers of the insect increased throughout the summer of 1927 on potatoes that had been rejected in harvesting, these being more important in this connection than weather conditions, and the infestation developed still further on the autumn crops. The elimination of the latter and the destruction of useless potatoes are the only certain means of destroying this pest.

During 1926 and 1927 thirteen parasites were reared in Virginia; of these, *Microbracon gelechiae*, Ashm., was the most abundant in the early part of the season while *Campoplex ferrugineipes*, Ashm., predominated in the latter part. The other species recorded are *Hormius pallidipes*, Ashm., *Campoplex phthorimaeae*, Cush., *Bassus gibbosus*, Say, *Chelonus phthorimaeae*, Gahan, *Orgillus mellipes*, Say, *Angitia* sp., *Meteorus vulgaris*, Cress., *Cardiochiles explorator*, Say, *Sympiesis stigmatipennis*, Gir., *Perilampus fulvicornis*, Ashm., and *P. granulosus*, Cwfd. The last two species are considered to be secondary parasites. With the exception of the last five species mentioned, these parasites were also reared from *Phthorimaea glochinella*, Zell. (egg-plant leaf-miner).

The characters distinguishing *P. glochinella* from *P. operculella* are discussed, including the larval habits and the morphology of the genitalia.

Plakidas (A. G.). **Strawberry Xanthosis (Yellows), a new insect-borne Disease.**—*J. Agric. Res.*, xxxv, no. 12, pp. 1057–1090, 1 pl., 13 figs., 17 refs. Washington, D.C., 15th December 1927.

In the course of detailed investigations, xanthosis, the most important disease of strawberry in California, was successfully transmitted from diseased to healthy plants by *Myzus fragaefolii*, Ckll. (strawberry aphis), Aphids that had not fed on diseased plants proving non-infective.

Experimental evidence is given to show that this disease is not due to a number of causes hitherto considered possible, including injury by *Tetranychus telarius*, L., while circumstantial as well as direct evidence was obtained proving that it is not caused by the virus of the sugar-beet curly-top, *Eutettix tenella*, Baker (beet leafhopper) being found incapable of transmitting the causal agent, either to strawberries or to beets.

The economic importance and geographical distribution of the disease are discussed, and the results are given of extensive cytological and histological studies of the different parts of the plant.

If it is proved that xanthosis is transmitted only by *M. fragaefolii*, the disease might possibly be effectively controlled by spraying and dusting with nicotine, by which means the Aphid is very readily killed. Specific and varietal resistance to xanthosis are briefly discussed.

FENTON (F. A.) & DUNNAM (E. W.). U.S. Bur. Ent. **Dispersal of the Cotton-boll Weevil,** *Anthonomus grandis* **Boh.**—*J. Agric. Res.*, xxxvi, no. 2, pp. 135–149, 9 figs., 8 refs. Washington, D.C., 15th January 1928.

The behaviour of *Anthonomus grandis*, Boh., differs considerably during the summer flight period compared with earlier in the year. This phase of the bionomics of the weevil was studied during 1924 and 1925. The beginning of the flight period was about 5 weeks earlier in 1925 than in the previous year. Flight is earlier in the more heavily infested fields, the tendency being to leave these for those that are less heavily infested, the weevils becoming restless and taking wing when the percentage of infestation reaches a certain point (not yet determined). More males were caught on the screens than females. Though the weevils may fly when the maximum temperature is between 60 and 80° F, the most favourable conditions are between 80 and 100° F. The temperature, however, is of secondary importance and acts only after the stimulus to flight has been aroused.

HILL (C. C.) & SMITH (H. D.). U.S. Bur. Ent. **Status of the Parasites of the Hessian Fly,** *Phytophaga destructor* **(Say), in Pennsylvania, Maryland and Virginia.**—*J. Agric. Res.*, xxxvi, no. 2, pp. 151–155, 1 ref. Washington, D.C., 15th January 1928.

Material collected from widely separated localities during a period of 10 years shows that the annual parasitism of the spring generation of *Mayetiola* (*Phytophaga*) *destructor*, Say, amounted to 62 per cent. The average total mortality, however, amounted to 96 per cent. Though the actual cause of this additional mortality was unrecognisable at the time, it was no doubt due to parasitism. A table is given showing the relative abundance of the 18 species of parasites concerned. Of the three Scelionids, *Platygaster vernalis*, Myers, is the most efficient parasite of the spring generation, *P. herricki*, Pack., is only prolific further south, while *P. hiemalis*, Forbes, is confined to the autumn generation, of which it is the only parasite. The annual mortality of this generation during the years 1914–1922 varied from 16 to 40 per cent., and in 1923 was as much as 55 per cent.

The more important Chalcidoids are, in the order of their abundance, *Eupelmus allyni*, French, *Merisus destructor*, Say, *Pleurotropis epigonus*, Wlk., *M. febriculosus*, Gir., and *Tetrastichus carinatus*, Forbes. Another ten species are comparatively scarce and in some years entirely absent. Their efficacy is further reduced by the fact that they may prey on one another, or on the species of *Platygaster*. Hyperparasitism is very prevalent, *P. vernalis* being especially subject to it owing to its occurrence in the host very early in the season. There is no evidence that any discrimination is made between parasite and fly in the selection of a host. The three species of *Platygaster* always oviposit direct in the egg of the fly and are therefore usually primary parasites.

McGregor (E. A.) & Newcomer (E. J.). U.S. Bur. Ent. **Taxonomic Status of the Deciduous-fruit** *Paratetranychus* **with Reference to the Citrus Mite** (*P. citri*).—*J. Agric. Res.*, xxxvi, no. 2, pp. 157–181, 6 figs., 20 refs. Washington, D.C., 15th January 1928.

A detailed account is given of cross-breeding and feeding experiments with the mite found on deciduous fruit-trees in the United States, which has generally been considered to be *Paratetranychus pilosus*, C. & F. (European red mite), and *P. citri*, McG. (citrus mite).

The following is taken from the authors' conclusions: The citrus mite, *P. citri*, and the European red mite, *P. pilosus*, are entirely distinct species. Practically all the evidence at hand favours this conclusion. It is also concluded that the citrus mite is distinct from the deciduous-fruit forms of *Paratetranychus* found in the United States. The only evidence indicating that the deciduous-fruit and citrus forms are not more than races of one species is the fact that they are rather similar in general appearance and have similar habits. Details are given of the morphological and biological characters of these forms that are considered to provide ample evidence that they are distinct species. The writers prefer to abstain from including the several European species of *Paratetranychus* in the treatment set forth here. When all the facts are considered, however, it appears that the closest American ally to *P. pilosus* is to be found in the Atlantic Coast deciduous-fruit species. The tarsus, penis, collar, trachea and ovum characters of the two latter species seem to agree very closely, and both species appear to feed chiefly on woody species of the Rosaceae. In comparing the Atlantic species with the red mite of the North-west, the writers have noted that the evidence is inconsistent; the anatomical characters fail to agree, whereas the rearing experiments suggest that they may be identical. Possibly for the present, it is best to call the Atlantic species *P. pilosus*, and to designate the deciduous-fruit mite of the North-west as *P. pilosus* var. *occidentalis*, n.

Swingle (H. S.). U.S. Bur. Ent. **Chemical Changes in Dusting Mixtures of Sulphur, Lead Arsenate, and Lime during Storage.**—*J. Agric. Res.*, xxxvi, no. 2, pp. 183–192, 10 refs. Washington, D.C., 15th January 1928.

The following is part of the author's summary: The dark colour of an old sulphur-lead-arsenate-lime dust is due to the formation of black lead sulphide during storage. Varying quantities of calcium arsenate are formed in different dusts ; the darker the dust, the more calcium arsenate there is present. All hydrated lime not reacting with sulphur or lead arsenate is converted into calcium carbonate within one year or less. The results of chemical analysis indicate that little or no change in insecticidal or fungicidal value during storage should be expected. There is some increase in danger of injuring the plant from the use of old dusts ; the darker the dust, the greater the danger of injury.

MARTIN (C. H.). **Biological Studies of two Hymenopterous Parasites of Aquatic Insect Eggs.**—*Ent. amer.*, viii, no. 3 (December 1927), pp. 105–156, 3 pls., 24 refs. Brooklyn, N.Y., 29th March 1928.

A detailed account is given of the life-history and habits of the Chalcid, *Trichogramma minutum*, Riley, and the Proctotrupid, *Tiphodytes gerriphagus*, Marchal, as well as notes on the habits of *Sialis infumata*, Newm., which is a new host record for *T. minutum.* This Chalcid parasitises the eggs of over 150 species of insects, a list of some of these (taken largely from Girault) being given. Other new hosts recorded are *Chrysops striatus*, O.S., *C. excitans*, Wlk., and *Tabanus lasiophthalmus*, Macq. Oviposition could not be obtained in the eggs of a Gyrinid or *Donacia* sp. *T. minutum* reproduces parthenogenetically. The deposition of an egg inside the host egg seems to stop all development of the latter unless the host embryo has used much of the yolk. It is not known how old the larva must be before it can tolerate the parasite and continue to develop. The parasite lays its eggs apparently indiscriminately in a host egg of any age. Both in the field and in the laboratory females were observed laying eggs in those of the host that were almost ready to hatch. The larva rapidly swallows the contents of the host egg. The larval and egg stages last 6–7 days, and the pupal stage 7–8 days. The generations are not defined, emergences occurring almost daily. Hibernation probably occurs in the egg, larval or pupal stage in some Lepidopterous egg, but only a small number survive the winter. The parasite does not materially reduce the numbers of the host except in abnormal seasons.

DETMERS (F.). **Canada Thistle,** *Cirsium arvense* **Tourn. Field Thistle, Creeping Thistle.**—*Bull. Ohio Agric. Expt. Sta.*, no. 414, 45 pp., 13 figs., 56 refs. Wooster, Ohio, November 1927.

In the course of this paper an account is given of the insects that attack *Cirsium arvense* in Ohio, including the following : *Pyrameis cardui*, L., responsible for extensive defoliation during 1924 ; *Dasyneura gibsoni*, Felt, which damages the seed heads ; *Trypeta florescentiae*, L., which infests the thistle heads and is itself parasitised by *Aprostocetus canadensis*, Ashm. ; *Anuraphis cardui*, L., the alternative food-plant of which is plum, of which it is sometimes a pest ; and *Capitophorus carduinus*, Wlk., which also feeds on artichoke. Except for the last two species, notes are given on the life-history and habits of these insects. Though some of them may cause considerable damage to thistles during severe infestations, no dependence can be placed on the duration and recurrence of their attack.

HASSAN (A. S.). **The Biology of the Eriophyidae, with special Reference to** *Eriophyes tristriatus* (**Nalepa**).—*Univ. Calif. Pub. Ent.*, iv, no. 11, pp. 341–394, 6 pls., 14 figs., 45 refs. Berkeley, Cal., 22nd March 1928.

This study of the biology of the ERIOPHYIDAE includes a discussion of the technique employed in collecting, mounting and sectioning, both for anatomical study of the mite and for the study of gall histology; a brief history of the mites and an account of their general morphology; a classification that includes keys to the genera of the sub-families ERIOPHYINAE and PHYLLOCOPTINAE, and descriptions of specific characters and the relationships of Eriophyids to other families.

Blister mites attack almost any plant organ except the roots, the type of injury being variable. Most of the species belonging to the subfamily PHYLLOCOPTINAE live in the buds or surfaces of the leaves or in the fruits, without forming galls, the injury caused by them being primarily due to loss of plant juice on which they feed. The species belonging to the ERIOPHYINAE, particularly those of the genus *Eriophyes*, vary much in their type of attack and cause galls of various shapes.

Details are given of the morphology and histology of the galls of *Eriophyes tristriatus*, Nal. (black walnut blister mite), which are produced by the adult, more than one mite rarely being found in a gall. Some account is given of the development and life-history of this mite in California, considerable attention being devoted to hibernation. Migration into hibernation quarters begins about the first week in October, the mites lodging themselves round the bases of compact buds. The hibernating places of mites depend entirely upon the form of the bud and whether the scales are sufficiently compact to allow them to crawl underneath. *E. fici*, Ewing, MS. (fig mite), *E. pyri*, Pgst. (pear mite) and *E. vitis*, Landois, all hibernate successfully under the scales. Hibernating mites do not contain mature eggs, the latter developing only in the spring. All stages of *E. pyri* have been observed in pear buds in the middle of March before they had actually opened, the high temperature within the buds as compared with the surrounding atmosphere probably stimulating the hibernating mites into activity. In the case of *E. tristriatus* no eggs were found until the gall was actually formed, the first indication of gall formation being seen in 1927 on 4th April, and the first eggs about 19th April. Galls examined in the third week in April, when the young larvae were first noticed, were found to be empty in some cases, and in others to contain a few eggs or eggs and larvae, most of the occupied galls containing one adult female laying eggs singly at various periods. Adult mites were observed by 1st May, the first generation thus occupying 3–4 weeks. The start of the second brood was indicated about the middle of May by an increase in the number of eggs, the adults appearing about the end of May. Breeding continues throughout the summer, but owing to overlapping, it is impossible to determine accurately the sequence of generations after the first. The number of eggs decreases during the latter part of the summer and is reduced to a minimum by early October. Migration to the growing tip, due to overcrowding in the galls, was noticed in the first week in June. Eggs and larvae of *E. fici* have been found on fig twigs from central California as late as November.

Dryness, which forces the mites to leave the galls, and summer heat, which excites them to activity, are the main stimulating factors, while excess humidity will render them almost motionless. The mites are hardy and can live under unfavourable conditions, hibernating in most cases without food. They are distributed by means of transportation of seedlings and cuttings, and infested leaves may be blown from one tree to another in the vicinity. Insects and other animals may also distribute them, but actual migration of the mites is impossible unless the branches of the tree are overlapping.

Four new species of Eriophyids are described, including *E. essigi*, sp. n., which infests the fruit of blackberry, loganberry and raspberry in California, producing the condition known as redberry, and has previously been recorded as *E. gracilis*, Nal. [*R.A.E.*, A, xiv, 247].

FLINT (W. P.). **Insect Control Work of the Natural History Survey for 1927.**—*Trans. Illinois Hortic. Soc. 1927*, lxi, pp. 99–110. Springfield, Ill. [1928.]

The most satisfactory results against codling moth [*Cydia pomonella*, L.] and plum curculio [*Conotrachelus nenuphar*, Hbst.] on apple were obtained by using lead arsenate in combination with lime-sulphur early in the season and with Bordeaux mixture in the late sprays (no very late sprays were applied) at the rate of 2 lb. in 50 U.S. gals. of spray mixture. Dusting did not give as good results as spraying, approximately 26 per cent. of the fruit being injured by *C. pomonella* as compared with 1–3 per cent. in the sprayed plots. Where sprays were used for the first brood and dust for the second, about 10 per cent. of the fruit was damaged. The results of tests with various materials for banding and with bands treated with various substances to kill the sheltering larvae are given. Observations indicate that approximately one-third of the larvae that hibernate on the trunks of trees are to be found on the area from one inch above to one inch below the surface of the soil, where they are more or less protected from extremes of temperature and from the attacks of birds. Other places selected for hibernation were very largely in accumulations of rubbish.

Definite proof has been obtained that in certain years *Conotrachelus nenuphar* has two generations a year in southern Illinois.

FLINT (W. P.). **New Sprays for Apple and Peach.**—*Trans. Illinois Hortic. Soc. 1927*, lxi, pp. 469–478. Springfield, Ill. [1928.]

Tests with various arsenical sprays were made during 1927, and although none proved as efficient as lead arsenate at a corresponding strength, some were sufficiently promising to warrant further experiment. Only certain types of oil emulsions are safe to use in the summer for spraying foliage. These consist of refined oils, usually emulsified with some chemically inactive emulsifying agent such as colloidal earths or gums. Experiments have shown that several of these oils cause a certain mortality among the eggs of the codling moth [*Cydia pomonella*, L.] that are actually hit by the spray. There was no indication that the oil spray on the fruit and leaves repelled the moths or prevented oviposition, though eggs laid on sprayed surfaces did not hatch so well. Experiments were therefore carried out to test the value of combining such oils with the lead arsenate sprays and from the results it appears that it will only be safe to use such sprays during the late May and June applications for winter apples; for summer apples they could probably only be used with advantage in the spray immediately following the calyx spray. Where such a combination was used in late sprays applied during July and August, practically no benefit was obtained, the residue was more difficult to remove and the appearance of the fruit was spoilt. However, in laboratory and small scale cage tests out of doors other oil combinations, containing stomach or contact poison incorporated in the oil phase of the emulsion, gave better results than lead arsenate, but up to the present it has not been possible to make any practical orchard tests with them.

BRITTAIN (W. H.). **Injurious Insects of Nova Scotia.**—*Bull. Dept. Nat. Resources, Nova Scotia*, no. 12, 157 pp., 66 pls., 58 figs. [Halifax, N.S.] 1st May 1927.

The object of this popular bulletin is to enable the farmer to identify the common farm pests quickly and deal with them promptly. A general account is given of insects, with a key for the identification of the common orders. The insects are dealt with under the various crops attacked, sections dealing with those injuring food and clothing and those attacking domestic animals and man being also included. A number of formulae together with instructions for making and applying various insecticides and fumigants are given.

BIRD (R. D.). **Life-history Notes on two Species of Sawfly injurious to the Fruit of the Choke Cherry.**—*Sci. Agric.*, viii, no. 8, pp. 497–501, 7 refs. Ottawa, Ont., April 1928.

The choke cherry (*Prunus virginiana*) is perhaps the commonest native fruit-tree of the Prairie Provinces of Canada, and the fruit, which is used to a considerable extent for food, is attacked by two sawflies, *Hoplocampa xantha*, Rohw., and *H. lacteipennis*, Rohw. The adults of both species emerge when the flowers of the choke cherry open, about the last week in May, and oviposit in the sepals, the choke cherry being the only known food-plant of the larvae. The life-history of *H. xantha* is very similar to that of *H. halcyon*, Nort., which attacks *Amelanchier spicata* [*R.A.E.*, A, xiv, 389], but there are only four larval instars, each of which is passed in a separate fruit, and the larvae are full grown in 16–20 days. The bionomics of *H. lacteipennis* resemble those of the other two species except in the habits of the larvae. The first instar occupies 6–7 days, and the second 3–4 weeks, the larva tunnelling in the hard seed-wall for about two-thirds of this time before boring into the soft pulpy interior of the seed; the third and fourth instars are passed in the same fruit as the second, the seed having grown sufficiently to provide enough food for the larva to complete its growth, 45–55 days after hatching. The second fruit attacked ripens, very little of the flesh being destroyed. The natural enemies of *H. xantha* and *H. lacteipennis* and the methods of control suggested are the same as for *H. halcyon*.

Ogilvie (L.). **Notes on the Growing of Citrus in Bermuda.**—*Agric. Bull. Bermuda Dept. Agric.*, vi, no. 11, pp. 3–5 ; no. 12, pp. 4–5 ; vii, no. 2, pp. 3–6 ; no. 3, pp. 4–6, 5 refs. Bermuda, November 1927–March 1928.

This paper on the cultivation of *Citrus* in Bermuda includes an account of nearly all the insect pests attacking it in the Colony, the most important of which is *Lepidosaphes beckii*, Newm. This scale is parasitised by a number of imported fungi [*R.A.E.*, A, xvi, 18] and is preyed upon by natural enemies, the most important of which are *Chrysopa* spp. The only species of whitefly present on *Citrus* is *Dialeurodes citrifolii*, Morg. It may be controlled by the application of oil emulsion and is parasitised by *Aschersonia goldiana* (yellow fungus), which was imported from Florida in 1924 and is well established, although it is only efficient in well-shaded situations. *Icerya purchasi*, Mask. (cottony cushion scale) is sometimes numerous but is usually successfully controlled by *Novius cardinalis*, Muls., which was introduced in 1902. *Pseudococcus citri*, Risso (common mealybug) is often found on the leaves, branches, twigs and fruit of *Citrus* during the drier parts of the year, accompanied by abundant sooty mould. Heavy autumn rains and routine spraying reduce the numbers of this scale, and it can easily be brushed off the trunk and branches when numerous. Favourite food-plants of this scale such as *Croton* and *Coleus* should not be grown near the orchard. Coccids found particularly on limes are *Saissetia hemisphaerica*, Targ., *S. oleae*, Bern. (black scale), *S. nigra*, Nietn., and *Eucalymnatus* (*Lecanium*) *tessellatus*, Sign., which are kept under control in some localities by a parasitic fungus, probably *Cephalosporium lecanii*. Other Coccids found on *Citrus* include *Chionaspis* (*Dinaspis*) *annae*, Mal., which is probably the species recorded by Verril from collections made about 1901 as *Chionaspis citri*, Comst., as the latter is not now believed to be present in Bermuda ; *Ceroplastes floridensis*, Comst. (Florida wax scale) ; and *Morganella maskelli*, Ckll.

Aphis gossypii, Glov. (melon aphis), the only Aphid occurring on *Citrus* in Bermuda, attacks and deforms the young leaves. It is usually kept in check by *Lysiphlebus* (*Aphidius*) *testaceipes*, Cress., an internal parasite that also attacks other Aphids, but it may be controlled artificially by dusting with nicotine dust or by spraying with 40 per cent. nicotine sulphate, 1–800, with the addition of a little soap. The Syrphids, *Mesogramma marginata*, Say, and *Allograpta obliqua*, Say, and the Coccinellids, *Cycloneda* (*Coccinella*) *munda*, Say, and *Scymnus terminatus*, Say, prey upon *A. gossypii*. The weevil, *Diaprepes* (*Exophthalmus*) *esuriens*, Gyl., causes rather severe damage by eating pieces out of the leaves, and may best be controlled by hand-picking. With the exception of severe damage to sweet oranges in certain localities and at certain times, *Citrus* fruits are free from attack by *Ceratatis capitata*, Wied. (Mediterranean fruit-fly).

Phyllocoptes (*Eriophyes*) *oleivorus*, Ashm. (rust mite) causes russeting of oranges and grape-fruit, and silvering of lemons ; *Tetranychus telarius*, L. (*sexmaculatus*, Riley) feeds on the lower surface of the leaves and produces large yellow spots and subsequent leaf-fall ; and *Paratetranychus* (*T.*) *citri*, McG., produces a pale grey or silvery effect over the surface of the fruit. Oil emulsions are not very effective against these mites, which are best controlled by sulphur, either as a spray consisting of 1 gal. lime-sulphur to 70 or 75 gals. water, or as a dust, mixed with hydrated lime at the rate of 3 : 1, applied in the evening when the nights are moist. A liquid emulsion of 3 to 4 lb. soap to 50 gals. water into which 1–5 lb. sulphur is stirred is a good substitute where lime-sulphur is not available, two or three applications being usually necessary to secure complete control.

Ogilvie (L.). **Insect Pests and Diseases of Corn in Bermuda.**—*Agric. Bull. Bermuda Dept. Agric.*, vii, no. 2, pp. 2–3. Bermuda, February 1928.

Maize is attacked in Bermuda by *Heliothis* (*Chloridea*) *obsoleta*, F. (corn ear worm), which is not found on any other plant in the Colony, and by *Peregrinus maidis*, Ashm. (corn leafhopper), which is also found on sugar-cane, *Sorghum* and the grasses, *Eleusine indica* and *Panicum dichotomiflorum*. The larvae of *H. obsoleta* cause most injury when the maize is coming into silk, by hollowing out large parts of the ears ; *P. maidis* attacks the upper surface of the leaves near their union with the stalk ; injury by both pests may be largely avoided by early planting, the greatest damage being done from July onwards. *Aphis maidis*, Fitch (corn aphis) is occasionally seen on maize, but is never numerous enough to require artificial control. Stored maize is attacked by *Calandra granaria*, L., *C. oryzae*, L., and *Araecerus fasciculatus*, DeG.

de Mel (C. N. E. J.). **Notes on Coconut Pests.**—*Trop. Agriculturist*, lxx, no. 2, pp. 85–86. Peradeniya, February 1928.

A recent survey of areas in north-western Ceylon infested with the coconut caterpillar [*Nephantis serinopa*, Meyr.] has shown that this moth has greatly decreased in all areas and has nearly disappeared in some. *Rhynchophorus ferrugineus*, F. (red weevil) on the other hand was found to be present in almost all parts of the north-western division, causing considerable damage and threatening further trouble in the near future. Young palms of good growth about 6–10 years old are the chief objects of attack, the cracking of the bark caused by rapidly increasing girth supplying a suitable place for oviposition. The larvae bore into the trees very rapidly and easily escape detection, but if the ear is placed close to the trunk they can be heard cutting the fibres.

de Alwis (E.). **The Brinjal Leaf-webber.** *Psara* (*Pachyzancla*) *bipunctalis*, **Fb.**—*Trop. Agriculturist*, lxx, no. 2, pp. 87–89, 1 pl., 5 refs. Peradeniya, February 1928.

Psara (*Pachyzancla*) *bipunctalis*, F., is a pest of *Solanum melongena* (egg-plant), the leaves of which are webbed together and skeletonised by the larvae, complete defoliation of the entire plant sometimes resulting within two days if the attack escapes detection in the early stages. In Ceylon it also attacks *Solanum xanthocarpum* and *S. indicum*, the latter being perhaps its chief food-plant, and in India it has been recorded on *Alternanthera*, *Schizandra* and *Croton*. It is widely distributed in Ceylon and southern India, and has also been recorded from West and South Africa and Java. The moth, all stages of which are described, both mates and oviposits at night, oviposition beginning 3–9 days after emergence. Under insectary conditions one female may lay 19–291 eggs, the females living 8–17 days and the males 8–16 days. The total life-cycle lasts from 36 to 43 days, the incubation period occupying 9–10 days, the larval period 18–22 days and the pupal period 9–11 days. The larvae on emergence fold themselves within a portion of the leaf on the epidermis of which they feed, finally spinning cocoons in which they pupate. In the early stages an attack may be checked either by crushing the larvae inside the leaves or by burning both leaves and larvae; in advanced stages of attack all webbed leaves and shoots should be cut off and destroyed.

Light (S. S.). **Pests of Tea Nurseries.**—*Tea Quarterly, J. Tea Res. Inst. Ceylon*, i, pt. 1, pp. 19–22, 1 pl. Nuwara Eliya, February 1928.

The importance of recognising the attacks of pests in tea nurseries in an early stage so that they can be effectively checked is not generally realised in Ceylon. This note describes the nature of the damage caused by the four principal pests of tea seedlings, *viz.*, eelworms [*Heterodera radicicola*, Greeff], the scarlet mite [*Brevipalpus obovatus*, Donn.], cutworms [*Agrotis ypsilon*, Rott.] and the red borer [*Zeuzera coffeae*, Nietn.], and gives recommendations for their control. Plants infested with *B. obovatus* should be sprayed with a mixture of 6 oz. flowers of sulphur, 1½ oz. soft soap and 1 gal. water, the application being repeated a week later if necessary. The soap is dissolved in 1 qt. hot water, and with this the sulphur is worked into a paste that is then stirred up with the remainder of the water; the fluid should be strained into the spraying machine and kept stirred during the spraying. Where *B. obovatus* is known to be present in the neighbourhood of nursery beds, young seedlings should be protected by dusting plants and beds with flowers of sulphur. Leaves of cabbage or sweet potato may be used as baits for cutworms after the seedlings have come up [*R.A.E.*, A, xv, 611], but it is preferable to rid the soil of cutworms before the plants come up; for this purpose a bait consisting of 1 lb. copper arsenite, 25 lb. bran, 3½ lb. jaggery, the juice of two or three oranges or limes and 1 gal. water is recommended. The jaggery is dissolved in the water (hot), the fruit juice is then added, and the liquid is used to work the bran and copper arsenite, which are mixed dry, into a stiff mash. The bait should be either broadcast over the beds or placed in small heaps at intervals between the plants. Seedlings that are nearly ready for planting out are sometimes attacked by *Zeuzera coffeae*, which then bores in the main stem; the usual method of controlling this borer is to cut back the stem until the larva is reached, but where, as in the case of seedlings, this may be inadvisable, the larva may be destroyed by inserting a sharply pointed piece of wire into the entrance hole of the tunnel.

Petch (T.). **Tea Tortrix.**—*Tea Quarterly, J. Tea Res. Inst. Ceylon*, i, pt. 1, p. 23. Nuwara Eliya, February 1928.

Homona coffearia, Nietn. (tea tortrix) was declared a pest in Ceylon on 11th November 1927. The effect of this proclamation is that the occurrence of the pest on any estate must be reported to the Director of Agriculture, who may prescribe the manner in which infested plants must be treated. The regulations so far published provide that all egg-masses, larvae and pupae of *H. coffearia* on tea must be collected and destroyed within 24 hours of collection, and that records of collections, by weight or by number of leaves, made on all estates over 10 acres in extent shall be sent to the Director of Agriculture at such intervals not exceeding three months as may be required by him.

SWEZEY (O. H.). **Entomology.**—*Rep. Comm. Expt. Sta. Hawaiian Sugar Pl. Assoc. 1926–97*, pp. 15–27. Honolulu, 1928.

In this report further notes are given on many subjects previously discussed [*R.A.E.*, A, xv, 319–323]. The leafhopper [*Perkinsiella saccharicida*, Kirk.] has been so scarce as to be practically negligible, and since this has been the situation during the past few years, it would appear that a state of equilibrium has been reached between it and its natural enemies that will prevent it from again becoming a pest. Although, in general, the cane borer [*Rhabdocnemis obscura*, Boisd.] has been satisfactorily controlled by the New Guinea Tachinid [*Ceromasia sphenophori*, Vill.], there continue to be outbreaks in which considerable damage is done. These usually occur in localities especially favourable to *R. obscura*, or in fields where the cane has been left standing long after maturity and much of it lies buried beneath an accumulation of trash where it is impossible for the Tachinid to reach its host. Where outbreaks occur year after year, cutting the cane at shorter intervals would obviate severe losses.

There were fewer outbreaks of army-worms, but two or three of these were very severe. In one case where *Spodoptera mauritia*, Boisd. (nut-grass army-worm) caused severe damage to very young ratoons in fields heavily infested with nut-grass (*Cyperus*), spraying with poisoned molasses was found effective. The Mexican Tachinid, *Archytas cirphis*, Curran, is now known to be established on all the Islands. The Scelionid, *Telenomus nawai*, Ashm., an egg-parasite of *Spodoptera mauritia*, has been found widely established on Oahu. Usually nearly all the eggs in a cluster of 200–300 are parasitised, one parasite issuing from each egg. Attempts to rear it on other Lepidopterous eggs all failed. Recently *Trichogramma minutum*, Riley, has occasionally been reared from the eggs of *S. mauritia*. *Larra luzonensis*, Roh. (mole-cricket wasp) has increased and become widely distributed on Oahu. The nut-grass moth borer has increased and spread but is not sufficiently abundant to make any noticeable reduction in the nut-grass. In one small area about one-quarter of the stems were affected, but they are not always killed. The nut-grass weevil borer, which was introduced at the same time as the moth [*R.A.E.*, A, xv, 321] was much slower in becoming established, but has now been recovered from two points. This weevil seems to destroy the " nuts " more completely than the larva of the moth.

The results of a large series of experiments confirm the fact that the corn aphis [*Aphis maidis*, Fitch] is the chief vector of mosaic to sugar-cane in Hawaii. *A. maidis* has been found on 34 graminaceous plants including maize, sugar-cane, *Sorghum*, several cultivated grasses, and nearly all the wild grasses in the fields, of which at least half have been found affected by mosaic. Successful transmissions were much fewer than the failures, and the experiments indicated that several factors were involved, the most important of which were temperature and humidity. It was also very difficult to transmit the disease to cane more than two months old, probably owing to the difficulty of getting the Aphid to feed on older cane. Other experiments showed that a plant once infected with mosaic retained the disease through repeated ratooning. It is believed to be the winged form of the Aphid that carries mosaic from maize or grasses to cane, and in the case of grasses in cane fields the winged forms are produced when the grasses go to seed. It is therefore recommended that the grasses be destroyed before maturing to prevent the production of winged forms.

What appears to be *Sesamia* (*Nonagria*) *uniformis*, Ddgn., or a closely related species, has been found established in one locality, where the larvae were boring the stems of a native grass, *Panicum torridum.* So far it has not been found on any other plant or in any other locality. This moth is a pest of maize, sugar-cane and rice in India. Several predators and a Tachinid parasite of *Rhabdocnemis lineaticollis*, Heller, which bores in sago palms, have been introduced in the hope that they will become established and attack *R. obscura.* Two consignments of *Apion ulicis*, Frst., which feeds on the seeds of gorse, have been received from England, but have apparently failed to breed. In England this weevil destroys a high percentage of gorse seeds, and since experiments to find out whether it feeds on the seeds of other plants have so far given negative results, it should prove a safe and effective check on the spread of gorse, which seems likely to become a worse pest than *Lantana.* Further experiments in pots with *Isotomodes* (previously discussed under the name *Isotoma*) are described, and definite experimental evidence was obtained which confirmed field observations that the presence of humus in the soil definitely reduces the pitting of cane roots by these Collembola.

WHITNEY (L. A.). **Report of Associate Plant Inspector, October-December 1927.**—*Hawaii. For. Agric.*, xxiv, no. 4, pp. 145–150. Honolulu, October–December 1927.

The pests intercepted include: from California, *Pseudococcus citri*, Risso, on *Coleus*, *P. maritimus*, Ehrh., on *Clematis*, bulbs of *Gladiolus* and apples, *Orthezia insignis*, Dougl., on *Coleus*, *Cydia* (*Carpocapsa*) *saltitans*, Westw., in seeds of *Euphorbia*, *Aphis maidis*, Fitch, and *Heliothis* (*Chloridea*) *obsoleta*, F., in green maize, *Leptothrips mali*, Fitch, on lily bulbs, *Merodon equestris*, F., in narcissus bulbs, *Cydia pomonella*, L., in pears, *Calandra* (*Sitophilus*) *oryzae*, L., and *Silvanus surinamensis*, L., in maize seed, *Hylemyia antiqua*, Meig. (*ceparum*, Meig.) in chives, and *Lepidosaphes ulmi*, L., on apples; from Washington, *Coccus hesperidum*, L., on holly; from Kansas, *Tribolium confusum*, Duv., in tomato seeds; from Japan, *Curculio* (*Balaninus*) *camelliae*, Roel., in chestnuts, *Tribolium castaneum*, Hbst. (*ferrugineum*, F.) in rice, *Pseudaonidia trilobitiformis*, Green, on citrus fruit, and *Bruchus chinensis*, L., in dried beans; from China, *B. chinensis* in dried beans, *Cylas formicarius*, Ol., in sweet potatoes, *Necrobia rufipes*, DeG., in chestnuts and ginger, *Cathartus advena*, Wlt., in chestnuts, yams, sweet potatoes, lily bulbs, etc., *Calandra oryzae* and *Dinoderus minutus*, F., in yams, lily bulbs, chestnuts, etc., *Silvanus surinamensis* and *Anthicus floralis*, L., in yams and water chestnuts, *Carpophilus humeralis*, L., in *Caladium*, yams, chestnuts, etc., and *Colobicus paralis*, Pasc., in chestnuts; and from the Philippines, *Bruchus chinensis* in dried beans and *Cylas formicarius* in sweet potatoes.

Veitch (R.). **Cutworms and Army Worms.**—*Queensland Agric. J.*, xxix, pt. 3, pp. 203–207, 1 pl. Brisbane, 1st March 1928.

Euxoa radians, Gn., is one of the most important cutworms in Queensland, and since its life-history and feeding habits may be regarded as typical, they are briefly described. The life-cycles of the army worms, *Cirphis unipuncta*, Haw., and *C. loreyi*, Dup., are somewhat similar. A list of the cultivated food-plants of army worms and cutworms is given. The most satisfactory means of controlling these pests is by a poison bran bait with the following formula: 25 lb. bran, 1 lb. Paris green, 1 qt. molasses, 2 oranges and approximately 2 gals. water. The method of mixing this is described. This bait may be broadcast over the infested area or a teaspoonful may be dropped near to, but not touching, each plant. It may also be scattered a few yards in front of an advancing line of migrating caterpillars, or placed at the bottom of a furrow with one straight side. If bait is not placed in the furrow, small holes should be dug at intervals of 10–12 ft., so that the caterpillars crawling along the bottom of the furrow fall into them and can easily be destroyed by means of a little kerosene. As an alternative to the use of poison bran baits the plants may be sprayed with lead arsenate, though this method is not considered so satisfactory.

The natural enemies of *E. radians* in Queensland include *Ooencyrtus* (*Schedius*) *euxoae*, Gir., which is a parasite of the eggs, and the Sphegid, *Ammophila suspiciosa*, Sm., which preys on the caterpillars.

Criddle (N.). **The Introduction and Establishment of the Larch Sawfly Parasite,** *Mesoleius tenthredinis*, **Morley, into Southern Manitoba. (Hymen.)**—*Canad. Ent.*, lx, no. 3, pp. 51–53, 7 refs. Orillia, Ont., March 1928.

A brief account is given of the history of *Lygaeonematus erichsoni*, Htg. (larch sawfly) in North America. Parasites were introduced from England in 1912 and liberated in a centre of infestation in southern Manitoba. Nineteen per cent. of the sawfly cocoons collected in 1916 were parasitised by *Mesoleius tenthredinis*, Morl., and the rate of parasitism increased each year until in 1920 it had reached 66 per cent. In 1926 a collection of cocoons was made in a locality ten miles from the spot where the parasites had originally been liberated, and of these 66 per cent. were parasitised. In 1927 the rate of parasitism was sometimes as high as 88 per cent. In the course of the 15 years since it was introduced, the parasite has survived all kinds of weather and spread from the place where it was liberated over a stretch of open prairie at least six miles in extent to a larch swamp beyond. It has penetrated to the limits of the swamp, which is some 20 miles across, not only covering the main area, but discovering every isolated tree. It is extremely active in searching for its host and apparently attacks larvae of all sizes. It emerges soon after its host, the eggs of which have barely time to hatch before it makes its appearance. The emergence of both host and parasite extends over a considerable period, and in 1927 the Ichneumonid was first observed on 13th July when several adults of *L. erichsoni* were still laying eggs, while the last parasite was seen on 19th August when the majority of the sawfly larvae had spun their cocoons. Since *M. tenthredinis* has been the dominant factor in bringing about the reduction of *L. erichsoni* in Manitoba, it has now been introduced into eastern Canada in the hope that similar results will be obtained.

SANDERS (P. D.). **The Plum Curculio and its Control.**—*Trans. Peninsula Hortic. Soc. 1928*, pp. 18–23. Dover, Del., 1928.

This paper combines a brief summary of American literature on the biology and control of the plum curculio [*Conotrachelus nenuphar*, Hbst.] on apple and peach with the results of five years' observations of the insect on the east coast of Maryland, where only one destructive brood has occurred each year during the period under review. The only insecticide hitherto found effective is lead arsenate, yet sprayed apples showed 72 per cent. of the fruit carrying curculio punctures in 1923, and although only 10 per cent. of rejected apples were injured by the weevil in 1926, 44 per cent. from the same orchard showed damage in 1927 after lead arsenate treatment ; the injury to peaches is even more serious, as it is followed by brown rot, which also enters the wounds caused by the oriental fruit moth [*Cydia molesta*, Busck].

Recommendations for control include the destruction of over-wintering adults by burning over woodland and hedges within 200 to 300 yards of the orchard, where they hibernate under rubbish ; the application to peaches of a spray containing 1 lb. lead arsenate to 50 U.S. gals., or a dust containing 5 per cent. lead arsenate, once when the petals have fallen and again as the sepals are falling ; and cultivation under the spread of the tree during the second and third weeks after the dropping of windfalls in June to destroy the pupae in the soil.

DOZIER (H. L.). **Codling Moth Observations in 1927.**—*Trans. Peninsula Hortic. Soc. 1928*, pp. 74–80, 4 figs. Dover, Del., 1928.

Most of the information given in this paper on the occurrence and control of the codling moth [*Cydia pomonella*, L.], which continued to be a major pest of apples in Delaware during 1927, has already been noticed [*R.A.E.*, A, xvi, 275, 394].

CORY (E. N.). **Insects of the Year 1927.**—*Trans. Peninsula Hortic. Soc. 1928*, pp. 80–87. Dover, Del., 1928.

The Japanese beetle [*Popillia japonica*, Newm.] was found to be present at five points in Maryland, at one of which there was a well-established colony. It was, nevertheless, agreed to leave this State outside the quarantine line on condition that the areas where the beetle was found were treated with carbon bisulphide and the larvae in the soil destroyed. Brief notes are given on the bionomics and control of the oriental peach moth [*Cydia molesta*, Busck], which continues to be a serious menace to the fruit industry, the codling moth [*C. pomonella*, L.], the late second brood larvae of which have in some instances been responsible for heavy damage, and the Mexican bean beetle [*Epilachna corrupta*, Muls.], a rather heavy and extensive infestation of which has occurred in the western counties of Maryland, and which is likely to spread rapidly to the east coast.

Luginbill (P.). **The Fall Army Worm.**—*Tech. Bull. U.S. Dept. Agric.*, no. 34, 91 pp., 49 figs., 67 refs. Washington, D.C., February 1928.

A very comprehensive and detailed account is given of the bionomics and control of *Laphygma frugiperda*, S. & A. (fall army worm). The first part includes its history, nomenclature, distribution, food-plants, life-cycle and habits, with technical descriptions of the various stages. The second part deals with its control by mechanical, chemical and cultural methods, and the third with its natural enemies and diseases.

The Hymenopterous parasites recorded from the United States are: the Ichneumonids, *Ophion bilineatus*, Say, *Sagaritis dubitatus*, Cress., *S. oxylus*, Cress., *Neopristomerus appalachianus*, Vier., *Paniscus geminatus*, Say, *Henicospilus purgatus*, Say, and *Pimpla* sp.; the Braconids, *Chelonus texanus*, Cress., *Apanteles marginiventris*, Cress., *Meteorus autographae*, Mues., *M. laphygmae*, Vier. (which is parasitised by *Dibrachys meteori*, Gahan, and *Spilochalcis torvina*, Cress.), *M. vulgaris*, Cress., *Rhogas terminalis*, Cress., *R. laphygmae*, Vier., and *Zele melleus*, Cress.; and the Chalcids, *Euplectrus comstocki*, How., *E. platyhypenae*, How., and *Trichogramma minutum*, Riley (which parasitises the eggs). Details are also given of various hyperparasites.

Dipterous parasites of the larvae are: the Tachinids, *Winthemia quadripustulata*, F., *Archytas piliventris*, Wulp, *A. analis*, F., *Phorocera claripennis*, Macq., *P. floridensis*, Town., *Hyphantrophaga hyphantriae*, Town., *Achaetoneura* (*Frontina*) *archippivora*, Will., *A.* (*F.*). *frenchi*, Will., *Admontia degeerioides*, Coq., *Exorista ceratomiae*, Coq., and *Gonia capitata*, DeG.; and the Sarcophagid, *Sarcophaga assidua*, Wlk.

The insect predators include: the Carabids, *Calosoma calidum*, F., *C. scrutator*, F., *C. sayi*, Dej., *Lebia analis*, DeG., *Galerita bicolor*, Drury, *Callida punctata*, Lec., and *Harpalus pennsylvanicus*, Dej.; the Cicindelid, *Tetracha carolina*, L.; the Coccinellid, *Ceratomegilla fuscilabris*, Muls. (which attacks the eggs); and the Rhynchota, *Podisus maculiventris*, Say, *Triphleps insidiosus* Say (which apparently feeds more often on the eggs than on the larvae), *Nabis ferus*, L., and *Sinea sanguisuga*, Stål.

Tapp (J. W.), Collier (G. W.) & Arnold (C. R.). **Farm Practices under Corn-borer Conditions.**—*Fmrs.' Bull. U.S. Dept. Agric.*, no. 1562, 20 pp., 10 figs. Washington, D.C., January 1928.

Substantial changes in farm practices are often necessary to prevent serious damage by the European corn borer [*Pyrausta nubilalis*, Hb.]. The present conditions in different parts of the infested area are discussed, and the remedial measures to be adapted to different conditions are indicated; they include modifications in the method of harvesting maize and the treatment and disposal of stubble, etc., and the replacing of maize by some other crop.

Nougaret (R. L.) & Lapham (M. H.). **A Study of** *Phylloxera* **Infestation in California as related to Types of Soils.**—*Tech. Bull. U.S. Dept. Agric.*, no. 20, 38 pp., 6 figs., 1 map, 1 pl., 8 refs. Washington, D.C., February 1928.

During 1915–1920 an extensive study was made of the soil in various districts of California with reference to the presence of *Phylloxera*.

The following is taken from the authors' summary: Infestation appears to be particularly frequent and pronounced in flat or depressed localities, where poor drainage is aggravated by the occurrence of shallow, compact and impervious subsoils and hardpan, giving rise to a condition of shallow-rooted vines and stagnating subsoil drainage. Where infestation occurs in deep, friable, recent-alluvial soils having porous subsoils, destruction of the vines is less rapid than in the more shallow soils. It is not certain whether this is due directly to better drainage and to the physical character of the soils less favourable to the development and life processes of the insect, or whether the vines in the more friable and productive deeper soils are better able to resist the injury caused by it.

Infestation is most frequent on moderately heavy or heavy soils that become sticky when wet and bake and crack when dry. Loose, porous, sandy soils that assume a dry, sandy condition in the field are rarely infested, even when in close proximity to areas of severe and long-standing infestation. It is suggested that the soils that shrink and crack when dry afford more crevices for free movement of the insect and a better shaded and protected environment during migration. On sandy soils the Aphids are forced to come to the surface and would probably not survive long under the hot arid conditions to which most of the vineyards in the interior valleys are subjected.

HASEMAN (L.). **Breeding Cages are solving the Codling Moth Problem.** —*Circ. Missouri Agric. Expt. Sta.*, no. 161, 4 pp. Columbia, Mo., July 1927.

The establishment of breeding-cages in the different orchard centres of Missouri, where exceptional damage has been caused during the past two years by the codling moth [*Cydia pomonella*, L.], has shown that failure to protect apples from the larvae has been largely due to irregularities in emergence. By blindly following the spray schedule the growers have failed to keep the fruit sufficiently well covered with spray throughout the period during which the larvae have been continuing to enter it, but in future the proper use of breeding-cage records will enable them to know definitely when and for how long they must keep the fruit thoroughly covered. Their recent failure to control the moth has led some of the growers to conclude that the arsenicals used in spraying are no longer effective, but although the larvae discard the first pieces of apple skin cut off by their mandibles, and are more intent, during the first few hours, on burying themselves in the fruit than on swallowing food, if the fruit is well covered they cannot avoid ingesting some of the fine poison granules, which eventually kill them. The small larvae readily cut through the smooth surface of the peel after laying down a mat of silk threads to which they hold with their feet.

The necessity for breeding-cage data is shown by the fact that in 1927, whereas the application of the calyx spray was completed according to schedule in most orchards by the end of April, and the first and second cover sprays for young larvae would have been completed by the 10th and 20th May respectively, the first moth actually emerged at Columbia on 21st May and the peak of emergence was reached about 4th June. The first considerable entrance of larvae occurred about 12th June. The first brood moths were still continuing to emerge on 20th June, while those of the second were likely to emerge during

July and August, possibly rendering the application of two July sprays a necessity. The first July spray applied at the peak of emergence is of great importance.

SNAPP (O. I.) & ALDEN (C. H.). **Paradichlorobenzene Experiments in the South for Peach-borer Control.**—*Tech. Bull. U.S. Dept. Agric.*, no. 58, 39 pp., 11 figs., 5 refs. Washington, D.C., March 1928.

This bulletin gives a comprehensive report of experiments with paradichlorobenzene for the control of *Aegeria exitiosa*, Say (peach borer) conducted in the peach belt of Georgia from 1922 to 1926 and also refers to the work conducted in 1921 [*R.A.E.*, A, xi, 534]. The following is taken from the authors' summary :—

Life-history studies showed that most of the adults emerge in Georgia during September. Gas for the control of the peach borer is most effective at the close of the oviposition period. Orthodichlorobenzene, paratoluidine and calcium cyanide were tested, but none of them was so safe as paradichlorobenzene. The last-named was used on the same trees in one orchard for five consecutive years, with no discernible injury to the trees, and resulted in almost complete eradication of the peach borers.

Poor results were obtained with large doses for short exposures, and only fair results with small doses applied at the regular time for long exposures. The ¾ and 1 oz. doses exposed to the trees for from 4 to 6 weeks gave excellent control of the borer. Paradichlorobenzene applied in central Georgia at the usual time (10th–15th October) gave a higher mortality than when applied 2, 4 or 6 weeks later. Spring applications are not so effective as those made in the autumn. Paradichlorobenzene is not safe to use in the Georgia peach belt on trees 1–3 years old, but if properly applied it is quite safe on older trees.

Laboratory experiments show that the larvae of *A. exitiosa* as far down as 1 foot below the soil are killed when the gas is confined in battery jars ; there is no difference in the effectiveness of the gas in the different soils used. The lower the temperature and the higher the moisture content of the soil, the slower are the evaporation of the crystals and the action of the resultant gas on the borers ; under some conditions the gas will remain in the soil throughout the winter. Under normal conditions all larvae are killed by a 1 oz. dose within 17 days ; the larvae feed to some extent after they have been exposed to the gas. When applied at the recommended time under normal orchard conditions, the ½ oz. dose has usually completely evaporated within 6 weeks, the ¾ oz. dose within 16 weeks, and the 1 oz. dose within 27½ weeks ; and borers 3 inches above and occasionally those 5 inches above the ring of crystals are killed by the gas.

Special studies under orchard conditions to determine the sum of hour-degrees above 55° F. necessary to evaporate different doses of paradichlorobenzene showed that there was no direct correlation between the hour-degrees and the amount evaporated. While the rate of evaporation was slower in 1925 than in 1924, heavy precipitation prevented the normal diffusion of the gas through the soil, concentrating the gas near the tree and producing more or less injury to young trees. Even 4-year-old trees were injured to some extent. The mortality from the doses used in these special studies was excellent, all borers being killed within the recommended period of exposure. Evidently high soil temperature accompanied by low rainfall or low soil temperature accompanied by high rainfall will cause paradichlorobenzene to injure young peach trees in Georgia. High soil temperature and a concurrent precipitation deficiency were the most dangerous weather conditions encountered on account of the rapid generation of the gas, which caused very severe injury to peach trees under 4 years old.

The following recommendations are made for applying the paradichlorobenzene. All grass, stones, and rubbish for about a foot out from the tree trunk should be removed and the soil surface smoothed with the back of a shovel. The crystals should then be placed in a continuous band about 1½ inches wide and 1½ inches from the trunk and covered carefully with a shovelful of clean soil ; several more shovelfuls should then be added and the soil packed around the tree to form a mound. The ring of crystals should always be placed above the topmost borer gallery, and if there are indications of borers above the normal level of the soil it should be raised so that the crystals can be placed above them.

The dosage for trees 4–5 years old is ¾ oz. per tree, the mounds and unspent crystals being removed after 4 weeks' exposure. For older trees a 1 oz. dose may be used with 6 weeks' exposure.

BRITTON (W. E.) & ZAPPE (M. P.). **Some Insect Pests of Nursery Stock in Connecticut.**—*Bull. Conn. Agric. Expt. Sta.*, no. 292, pp. 119–173, 20 pls., 27 figs. New Haven, Conn., December 1927.

Brief notes are given on the more important pests of nursery stock in Connecticut. The insects are arranged under the headings of general feeders, and insects injuring fruit stock, shade and forest trees, shrubs and vines, evergreens, and perennials ; and for convenience in identification a popular key is given for each class, based mainly on the external characteristics of the insect and the injury it causes. In most cases one or two references to fuller sources of information are appended.

SMITH (R. C.). *Lasius interjectus* **Mayr (Formicidae), a Household Pest in Kansas.**—*J. Kansas Ent. Soc.*, i, no. 2, pp. 38–42, 9 refs. McPherson, Kans., April 1928.

There are various records of *Lasius interjectus*, Mayr, as a household pest in Kansas. The only means of preventing the entry of this ant into houses is to fill up cracks from which they are seen to emerge with cement or asphaltum. Boiling water poured on the ants as they come out of such openings or calcium cyanide sprinkled about the place of emergence will kill them, but as these measures do not affect the nest, they will only give temporary relief.

MCCOLLOCH (J. W.). **Dispersal of Scarabaeids by Flood Waters.**—*J. Kansas Ent. Soc.*, i, no. 2, pp. 43–44. McPherson, Kans., April 1928.

Instances are given of Lamellicorn beetles being carried by streams in flood. These include mainly *Lachnosterna* (*Phyllophaga*) spp. The beetles were alive, and in several cases eggs were obtained for life-history studies. One individual of *L.* (*P.*) *hirticula comosa*, Davis, and one of *L.* (*P.*) *hirtiventris*, Horn, had eggs of the Tachinid parasite, *Cryptomeigenia theutis*, Wlk., on the thorax, and these eventually hatched.

Stearns (L. A.). **The Oriental Fruit Moth** (*Laspeyresia molesta* **Busck**).—*Bi-m. Bull. Ohio Agric. Expt. Sta.*, xiii, no. 2, pp. 35–43, 7 figs. Wooster, Ohio, March–April 1928.

Cydia (*Laspeyresia*) *molesta*, Busck, is now generally distributed throughout the peach growing areas of Ohio, and though of comparatively recent introduction, it causes considerable injury. An account is given of the type of injury to twigs and fruit, as well as notes on the life-history and habits of the moth. During 1927 the larvae of the first brood had hatched on 1st May in southern Ohio, and by 15th May the twig injury was severe. Under insectary conditions there were 5 broods of larvae during 1927. Extensive laboratory tests and orchard spraying experiments indicate that nicotine as an ovicide will partly control *C. molesta*. The eggs are present on the foliage throughout the season, the period of maximum abundance varying from year to year, so that it is very difficult to ascertain the best time for applying an ovicide. Overwintering larvae near the surface of the ground are killed by paradichlorobenzene applied against the peach tree borer [*Aegeria exitiosa*, Say]; this treatment should be combined with spring cultivation [*R.A.E.*, A, xv, 261].

Cutright (C. R.). **The Black Cherry Aphis.**—*Bi-m. Bull. Ohio Agric. Expt. Sta.*, xiii, no. 2, pp. 44–48, 1 fig. Wooster, Ohio, March–April 1928.

This is a somewhat popular account of *Myzus cerasi*, F. (black cherry aphis), which causes considerable damage to cherries in Ohio. A list of the food-plants is given. Though sweet cherry (*Prunus avium*) is preferred by this Aphid, it is frequently found on sour cherry (*P. cerasus*), on which it lives and reproduces normally. The alternate food-plants, to which the Aphids migrate as the growing shoots of cherry harden, are peppergrass (*Lepidium apetalum*) and possibly some related plants.

The Aphid may be almost completely controlled by the use of an oil spray in the dormant season followed by dormant strength lime-sulphur and nicotine sulphate just before the buds open. It is believed that the latter spray alone, provided that it is applied thoroughly before the buds burst, will give practical results. It is useless to spray sweet cherries after the buds have opened, but on sour cherries, the leaves of which are not curled by the Aphids, good results might be obtained with nicotine. Formulae for the sprays recommended are given.

Studies of Insects, Insect Pests and other Animals.—*40th Rep. S. Carolina Expt. Sta., 1926–27*, pp. 34–44, 5 figs. Clemson College, S.C., December 1927.

Tests for the control of *Heliothis obsoleta*, F. (tomato fruit worm), which caused less injury to tomato in 1927 than in the previous year, showed more than 50 per cent. reduction in infested fruit in treated as compared with untreated plants. Though dusting was found to be more rapid and less laborious than spraying, sprayed plants remained strong and green for a longer period than dusted plants. Investigations of the biology and control of the cotton flea hopper [*Psallus seriatus*, Reut.] begun in 1926 [*R.A.E.*, A, xv, 404] were continued in 1927. Observations showed the pre-oviposition period to range from 3 to 8 days, the oviposition period from 2 to 17 days, and the total life of the adult females from 6 to 26 days, with an average of 15·8. The total number of eggs producing nymphs laid by one female ranged from 5 to 42, with an average of 24·4. The average duration of the total nymphal development was 16·3 days, which, added to the average incubation period, gives a total of 25·16 days for the incubation and development of one individual. In 1927 the incubation period shortened after June until the middle of August, when it reached its minimum, and subsequently gradually increased.

After causing less damage than usual in 1926, the Mexican bean beetle [*Epilachna corrupta*, Muls.] spread about 80 miles in a south-easterly direction in 1927, when climatic conditions were favourable to its development. This increase is more than twice that which occurred in any of the favourable years 1921–1924. The beetles began to be active about 1st May and the first eggs were laid about 11th May, the highest emergence occurring during the last third of that month. There was one complete generation, with a partial second and third, while a few adults of a fourth were expected to enter hibernation before becoming active.

CUTRIGHT (C. R.) & HUBER (L. L.). **Growth Condition of the Host as a Factor in Insect Abundance.**—*Ann. Ent. Soc. Amer.*, xxi, no. 1, pp. 147–153, 11 refs. Columbus, Ohio, March 1928.

The authors discuss the effect of the growth condition of the food-plant, whether physical, chemical or nutritional, or a combination of all three, on the abundance of insects, quoting a number of examples from the literature. Studies of *Aphis pomi*, DeG. (green apple aphis) carried out over a number of years in Ohio by the senior author show that the degree of infestation is determined by the vigour of growth of the terminal buds and twigs of the food-plant, and the length of the period over which such growth takes place. Any condition that tends to produce succulent growths, such as rich soil, cultivation, fertilisation, or certain types of pruning, is favourable to the Aphids. Outbreaks of *A. pomi* are terminated by the hardening of the twigs, which causes it to die or migrate.

The work of the junior author and C. R. Neiswander on the European corn-borer [*Pyrausta nubilalis*, Hb.] has shown that the growth condition of the maize affects the ultimate borer population both in regard to varieties of maize planted on the same date and on the same soil and in regard to varieties planted on different dates. From the data available it is concluded that early planted maize is more severely attacked because of its condition of growth and stage of development, laboratory studies having also shown that the moths are more strongly attracted to distillates from early maize than to those from late maize. The importance of locating this factor in biological studies is emphasised with a view to utilising it in applied work.

ODELL (T. T.). **The Food of Orchard Birds with special Reference to the Pear Psylla.**—*Bull. N. Y. Agric. Expt. Sta.*, no. 549, 19 pp., 2 pls., 3 figs., 5 refs. Geneva, N.Y., December 1927.

Experiments were conducted in New York State from 1923 to 1926 to determine the value of orchard birds as destroyers of *Psylla* (*Psyllia*) *pyricola*, Först. (pear psylla) and the possibility of increasing the number of insectivorous birds in orchards. Large numbers of this Psyllid are eaten by birds that do not live in orchards during the summer, but are present in the winter. The number of some of them can be increased in the orchard during the winter by supplying suet and sunflower seed as food, but efforts to increase the number of insectivorous birds nesting in the orchard were successful only in the case of two species of little value.

Entomology.—*Rep. Iowa Agric. Expt. Sta., 1926–27*, pp. 33–38. Ames, Iowa. [1928.]

Insects of the year include *Heliothis obsoleta*, F. (corn earworm), which destroyed practically one-fourth of the sweet maize crop and 5–10 per cent. of the field maize crop ; *Papaipema nitela*, Gn. (*nebris*, Hb.)(common stalk borer), which is common on a number of plants ; *Pyrausta ainsliei*, Hein. (smartweed borer), which is easily mistaken for *P. nubilalis*, Hb., and from which five different species of parasites were bred ; and *P. penitalis*, Grote (lotus borer), which was used as host for rearing *Microbracon* (*Habrobracon*) *brevicornis*, Wesm., a foreign parasite of *P. nubilalis*, which also accepts as hosts *P. ainsliei* and *Epiblema otisana*, Clem. *Loxostege sticticalis*, L. (sugar beet webworm) occurred in large numbers on Russian thistle [*Salsola*] and lamb's quarters [*Chenopodium*], and the larvae of the second generation migrated to lucerne and maize, interfering with fertilisation by feeding on the silk in the latter case. Injury to apple by *Tachypterellus* (*Anthonomus*) *quadrigibbus*, Say, was reduced by the use of pigs from 70 per cent. in 1925 to 2 per cent. in 1926. Several species of cutworms, including *Nephelodes minians*, Gn., on pasture and *Prodenia ornithogalli*, Gn., on maize foliage, were unusually abundant in 1926 and 1927. No commercial damage was done by the Hessian fly [*Mayetiola destructor*, Say] in 1926, but *Meromyza americana*, Fitch, was common and did slight occasional damage to wheat. A new pest of flowers, *Homoeosoma electellum*, Hulst, was particularly abundant, being most numerous and destructive on marigolds.

HARMAN (S. W.). **Midsummer Sprays for the Peach Cottony Scale.**—*Bull. N. Y. Agric. Expt. Sta.*, no. 552, 22 pp., 2 pls. Geneva, N.Y., February 1928.

Pulvinaria (?) *amygdali*, Ckll. (peach cottony scale) occurred in destructive numbers in western New York during 1925, and experiments were undertaken with a number of insecticides, an account of which is given.

The following is taken from the author's conclusions : Of the insecticides tested, the highly refined white mineral oil emulsions and nicotine sulphate and soap sprays produced little or no injury to peach foliage. When used in combination with Bordeaux mixture or applied on foliage retaining sulphur residues, the white oil sprays caused severe shot-hole injury and premature dropping of peach leaves. Egg-masses protected by the cottony ovisacs were not appreciably influenced by mixtures that proved safe to peach foliage. Newly hatched larvae succumbed to treatments with white mineral oil emulsions. One thorough application of a 2 per cent. emulsion at the end of the egg-hatching period gave commercial control. Nicotine sulphate and soap sprays proved less effective than the white mineral oil emulsions. In order to obtain satisfactory control of *P. amygdali* by midsummer treatments, the sprays must be carefully applied in order to reach the majority of the young scales without a great expenditure of time and materials. In severe infestations two applications should be made about a week apart. Applications should be made before smutting of the fruit is discernible and if possible immediately after the complete hatching of the eggs. Owing to the difficulties in securing thorough applications, because of the interference of foliage and the danger of injury to peach trees, midsummer treatments should only be undertaken as an emergency measure, though during the three years in which these experiments were carried out no injury was noticed when the oils were applied to foliage free from sulphur or copper spray residues.

The most satisfactory remedial measure against *P. amygdali* is an oil spray applied when the buds begin to swell during early spring.

PARROTT (P. J.). **The Apple Aphids in Relation to Profitable Spray Practices.**—*Proc. 73rd Ann. Meeting N.Y. State Hortic. Soc.*, pp. 6–14. Rochester, N.Y., 1928.

The three Aphids attacking apple foliage and fruit in New York are *Anuraphis roseus*, Baker (rosy apple aphis), *Aphis pomi*, DeG. (green apple aphis) and *Rhopalosiphum prunifoliae*, Fitch (apple-grain aphis). The first two are the more important. As a rule the eggs of these Aphids begin to hatch when the buds start to break, and most of them have hatched when the tips of the leaves of the first blossom buds are projecting as much as half an inch.

From the results of spraying experiments during 1925 and 1927, the following conclusions are drawn: Newly hatched larvae are more susceptible to treatment with spray mixtures than are the eggs. Applications made when the leaves were projecting ¼ in. or more were as a rule more satisfactory than those made at the dormant or green-tip periods; the most satisfactory spray for the delayed dormant treatment of apple orchards in western New York is 2½ U.S. gals. lime-sulphur, 1 U.S. pt. 40 per cent., nicotine sulphate, 2½ lb. lead arsenate and 100 U.S. gals. water. The most promising alternative spray containing a fungicide for the delayed dormant treatment is Bordeaux and oil emulsion; preparations containing 4 per cent. of oil are the most efficient, as lower percentages have little effect on the Aphids while higher ones injure the blossom buds. So far there has been no evidence of any serious ill effects from home-made emulsions, but should subsequent experience show that 4 per cent. oil is too strong for blossom buds with leaf tips projecting as much as ¼ or ½ in., a possible solution would be to reduce the oil content to 3 per cent. and add 1 pint of nicotine solution to each 100 gals. Unless the oil spray is required for the control of red spider [*Tetranychus*] it is safer to use lime-sulphur for the delayed dormant treatment. At this period the majority of the Aphid eggs have hatched and the young larvae are easily hit by the spray owing to the lack of foliage. The ends of the buds should be thoroughly wetted by the spray so that all the young Aphids clustering around the opening buds are hit.

This one spray is sufficient to control *Anuraphis roseus*; *Aphis pomi* is not likely to become troublesome until about June, and even then it seldom causes sufficient damage to warrant additional treatment in midsummer. Palliative measures, however, should be carried out systematically each year; they include removal of suckers and judicious pruning of trees that are carrying an excessive amount of wood. In timing midsummer treatment the spray or dust should be applied as soon as the Aphids appear in the fruit clusters. The preferred sprays are soap and nicotine sulphate, or lime-sulphur at summer strength with nicotine sulphate in the usual proportions. The dust recommended is 3 per cent. nicotine and hydrated lime.

HARTZELL (F. Z.). **Use of Oils for Pear Psylla Control.**—*Proc. 73rd Ann. Meeting N.Y. State Hortic. Soc.*, pp. 22–30. Rochester, N.Y., 1928.

This is a short account of experiments with oils for the control of *Psylla* (*Psyllia*) *pyricola*, Först. (pear psylla) carried out in New York in 1926 and 1927. Though excellent results were obtained, the oil sprays are not recommended in place of the regular spray schedule unless the latter has failed to control the Psyllid. The precautions necessary in the preparation and application of oil sprays for pears are described. It is important to use the right type of oil and a suitable emulsifier, such as Bordeaux mixture or casein-lime. With commercial emulsions it is recommended that a mixture containing actually 3 per cent. of oil be used; it should be applied in the late dormant period. This should not be confused with the delayed dormant spray of apple; the term is used to describe the condition of pear trees when the most satisfactory treatment can be made with the less refined oil sprays. At this time, which coincides with the first warm days of spring, the buds appear to be totally dormant but careful examination will show that there is a slight swelling, with the bud scales just beginning to separate, though there is no evidence of new growth. After this period too many eggs will have already been deposited for the results to be satisfactory, and there is danger of bud injury. Though this treatment may protect the trees throughout the season, if the infestation is not too severe, it is possible that in years of great abundance further supplementary treatment may be necessary.

DANIEL (D. M.). **Biology and Control of the Blackberry Leaf-miner** —*Tech. Bull. New York State Agric. Expt. Sta.*, no. 133, 38 pp., 1 pl., 5 figs., 11 refs. Geneva, N.Y., February 1928.

Injury by the sawfly, *Metallus rubi*, Forbes (blackberry leaf-miner), has led to the abandoning of certain plantings of blackberries in western New York, heavy infestations for successive years that sometimes resulted in the destruction of 60–70 per cent. of the total leaf surface having weakened the plants and caused them to produce poorly developed fruit of inferior flavour. Blackberry is the preferred food-plant, although dewberry is also attacked, but the author has never observed the larvae in raspberry leaves, in which a few have been reported to occur in Ontario.

All stages of the sawfly, the method of oviposition and the habits of the larvae and adults are described. The eggs of the first generation are laid during June and hatch in about two weeks ; the larvae feed for about 28 days, eating the entire inner tissue of the leaves, and then drop from the leaves and burrow into the earth, where they construct pupal cells at a depth of 1–2 inches and pupate after about 4 days ; the adults emerge about 12 days later, during the latter half of August and September. The eggs of the second generation are laid by these adults shortly after emergence and hatch in about 8 days, and the larvae become full grown and enter the ground for hibernation after about 17 days, during September or October. These larvae hibernate at a depth of 6–8 inches in loose soil and construct pupal cells at a depth of 1–2 inches in the following spring when the soil gets warm, pupate, and produce adults in June. In the autumn of 1926 many larvae were probably killed by the wet weather and frosts that set in before all had entered the ground for hibernation. Parasitism of the larvae during 1926 and 1927 ranged from 0 to 84 per cent. in one case, the average being about 4·5 per cent. Two species of parasites were reared, belonging to the genera *Exothecus* and *Eulophus*.

Experiments for the destruction of the larvae in the mines were made with various sprays. Two highly refined white oil emulsions, Volck and Medina summer emulsion, each at 4 per cent., killed an average of 54 and 39 per cent. of the larvae respectively, the extent to which the oil penetrated into the mine and the resultant kill varying more or less directly as the size of the mine. In two experiments Derrisol, 1–250 and 1–200, killed 66 and 61 per cent. respectively. Nicotine sulphate, 1–400, killed only 18 per cent. None of these sprays was effective against the eggs in the leaves. Nicotine sulphate and the oil emulsions were ineffective against the adults ; a pyrethrum soap spray applied at 4.30 a.m. when the adults were inactive on the leaves at the bases of the plants killed such as it hit, but these were not enough for the numbers to be reduced appreciably.

Baerg (W. J.). **Three Shade Tree Insects.**—*Bull. Arkansas Agric. Expt. Sta.*, no. 224, 25 pp., 13 figs., 35 refs. Fayetteville, Ark., April 1928.

The bagworm, *Thyridopteryx ephemeraeformis*, Haw., occurs in all parts of Arkansas and causes considerable damage to cedar, arborvitae [*Thuja*], boxelder [*Acer negundo*] and willow ; a list of additional food-plants is given, but most of these are insufficient for the complete development of the insect. Hibernation occurs in the egg stage, and the larvae, which hatch about May, immediately make cases. The larval stage lasts about 100 days ; when full-grown the larvae often drop to the ground and migrate to other trees, where the cases are securely fastened to a twig and pupation takes place. The adults emerge in from 28 to 38 days, beginning in early September and continuing to appear till the middle of October. The female adults are wingless, and after mating oviposit in their cases and then drop to the ground to die. A list is given of the parasites of the larvae ;

those observed by the author have already been noticed [*R.A.E.*, A, xv, 92]. Infested trees may be sprayed with lead arsenate (1 lb. powder in 50 U.S. gals. water) in late May and June.

Datana integerrima, G. & R. (walnut caterpillar) is an important pest of walnut and pecan, trees being entirely defoliated and killed if attacks occur in 3 or 4 successive years. Hibernation takes place in the pupal stage in the soil. The moths emerge about the middle of May and deposit eggs in masses containing an average of 800 on the lower surface of the leaves. The larvae hatch in about 10 days and feed gregariously, pupating in about a month, the earliest and latest dates of pupation recorded being 8th and 30th July. The moths emerge about 18 days later, and deposit eggs that hatch between 9th and 24th August. The resulting larvae pupate in September. The second generation very seldom does any serious damage, the eggs being heavily parasitised by *Telenomus ichthyurae*, Ashm. Other parasites have already been noticed [*R.A.E.*, A, xiii, 566, xv, 92]. *D. integerrima* may be controlled by hand-picking or spraying with the mixture recommended above.

Hyphantria cunea, Dru. (fall webworm) attacks walnut, elm, maple, oak and other shade trees as well as fruit trees, but in north-western Arkansas is mainly injurious to persimmon and hickory. Hibernation takes place in the pupal stage in a thin cocoon, under leaves, etc., or just below the surface of the soil, the moths emerging in June and July. Egg masses are laid on the lower surface of the leaves. The larvae hatch in 8–12 days and spin densely woven tents, which may entirely cover a small tree. Pupation takes place after 35 to 50 days. Under especially favourable conditions a partial second generation may occur. *H. cunea* is attacked by a number of parasites, of which *Apanteles hyphantriae*, Riley, and *Hyposoter pilosulus*, Prov., were reared by the author. Orchards in which applications of an arsenical spray are made annually are seldom appreciably damaged by *H. cunea*, but after the larvae are half-grown, no insecticide now in use is effective, inconclusive experiments having been conducted with lead arsenate, calcium arsenate, zinc arsenite, sodium fluosilicate, calcium fluosilicate compound, calcium cyanide, and cocotine. The best measure of control is to destroy the nests directly they appear.

HOLLOWAY (T. E.), HALEY (W. E.), LOFTIN (U. C.) & HEINRICH (C.). **The Sugar-cane Moth Borer in the United States.**—*Tech. Bull. U.S. Dept. Agric.*, no. 41, 76 pp., 2 pls., 25 figs., 35 refs. Washington, D.C., March 1928.

A comprehensive and detailed account is given of the bionomics and control of *Diatraea saccharalis*, F. (sugar-cane moth borer) in the United States [*cf. R.A.E.*, A, vii, 407]. The following is largely taken from the authors' summary: During the years 1922 to 1926 inclusive, *D. saccharalis* caused a loss in sugar production of 292,198 tons in Louisiana alone. The larvae tunnel into the interior of the stalks, killing the young cane, and weakening the older cane (making it more susceptible to damage by wind and fungi) and in any case lowering the quantity and quality of juice produced. This Pyralid is a native of the West Indies or South America, but was probably present in Louisiana before 1857, and is now found also in Florida, Mississippi and Texas. It will breed in *Sorghum* and a number of other grasses and readily attacks maize. As many as four generations occur in a year, the winter being passed in the larval stage. The moths emerge in spring and deposit their eggs in clusters on the young cane shoots. The egg stage lasts 4–9 days. The larvae enter the stalks after the first moult. The larval period ranges from about 18–30 days in summer to 276 days for hibernating individuals. The pupal period also varies widely, but averages 8·5 days; it is passed in an enlargement of the tunnel made by the larva. The adult may live 3–8 days, the entire life-cycle generally occupying about 43.

The seasonal history may be assumed to begin in the latter part of April. The first brood is not numerous enough to do great damage, but the fact that there may be four generations a year and 200 eggs for each female accounts for the high infestation reached in the autumn.

The numbers of *D. saccharalis* are reduced to some extent by any period of excessive rainfall during the winter and spring, frost, and probably to the greatest degree by the egg parasite, *Trichogramma minutum*, Riley. Artificial methods of control include: the fostering of the parasite by leaving rubbish in the fields (not including pieces of cane); the collection and destruction of pieces of cane left about the plantation; the possible substitution of some other crop for maize, since a greater number of broods occur on this crop than on cane; low cutting of the cane; the destruction of large grasses; the introduction of foreign parasites; and the treatment of seed cane. The most promising method of treating seed cane is by submerging it in water to kill the larvae, but this, or any other control measure, is ineffective unless applied over a large area.

TAYLOR (R. L.). **The destructive Mexican Book Beetle comes to Boston.**—*Psyche*, xxxv, no. 1, pp. 44–50, 14 refs. Boston, Mass., March 1928.

A large shipment of books from Honolulu was found in Massachusetts in 1927 to be severely damaged by a tropical Anobiid of the genus *Catorama*. Some account is given of the bionomics of beetles of this genus. In studies made to determine whether the insect could survive under Massachusetts conditions, the larvae were seen to be active and to feed for seven weeks at room temperatures. In view of the possible infestation of heated libraries throughout the city, the infested stock was treated with carbon bisulphide.

COCKERHAM (K. L.). U.S. Bur. Ent. **The Sweet Potato Weevil on the Islands in the Mississippi Sound.**—*Quart. Bull. Miss. Pl. Bd.*, vii, no. 4, pp. 3–4, 1 ref. A. & M. College, Miss., January 1928.

Cylas formicarius, F. (sweet potato weevil) has been found on various species of morning glory (*Ipomoea*) on the islands in the Mississippi Sound. As the weevils can withstand immersion in water for a considerable period of time, they may be transported to the mainland in parts of infested plants broken off by storm tides and high winds.

A threatening Situation.—*Quart. Bull. Miss. Pl. Bd.*, vii, no. 4, p. 5. A. & M. College, Miss., January 1928.

The pink bollworm [*Platyedra gossypiella*, Saund.] has been found in seven counties in West Texas, the infested area covering over 300,000 acres on the edge of the main cotton belt.

COTTON (R. T.) & ROARK (R. C.). **Fumigation of Stored-product Insects with certain Alkyl and Alkylene Formates.**—*Indust. Engng. Chem.*, xx, no. 4, p. 380 *et seq.* (reprint, 5 pp.). Easton, Pa., April 1928.

The following is taken mainly from the authors' summary: the vapours of methyl, ethyl, *n*-propyl, isopropyl, *n*-butyl, isobutyl, isoamyl and allyl formates are toxic to insects infesting stored products, such as *Calandra* (*Sitophilus*) *oryzae*, L. (rice weevil), *Tineola bisselliella*, Humm. (clothes moth), *Attagenus piceus*, Ol. (black carpet beetle), and *Anthrenus vorax*, Csy. (furniture beetle).

All these formates, except the methyl and ethyl formates, can be made free from fire hazard by the addition of carbon tetrachloride to the extent of 60 to 75 per cent. by volume of the mixture. The results are given of tests made to determine the minimum lethal dose in the case of each fumigant, and their effect on the germination of wheat, as well as of fumigation tests on a large scale, which show some of the mixtures to be both promising and economical.

ROARK (R. C.). **Economic Aspects of the Use of Insecticides**—*Chemical Markets*, xxii, no. 3, pp. 303–304. [*Sine loco*] March 1928.

The available statistics regarding the production and consumption of insecticides in the United States and the estimated annual loss of crops due to insect attack are briefly reviewed, and a short account is given of the uses of the various insecticides. Though the value of the total production of insecticides appears small when compared with other industries, it is of the greatest economic importance when considered in relation to the value of crops, livestock, forests and stored products saved.

RODRIGUEZ (G.). **A Laboratory Study of Ovicides for Froghoppers.**—*Min. & Proc. Froghopper Invest. Comm., Trinidad & Tobago*, pt. x, pp. 348–351. Trinidad, 1928.

This is a summary of experiments begun in February 1927, most of which have been already noticed in the monthly progress reports. Cyanogas calcium cyanide powder, dusted lightly on sugar-canes through a piece of muslin proved very efficient as an ovicide for the froghopper [*Tomaspis saccharina*]. Paradichlorobenzene might be worth trying in the field, but is inferior to cyanogas. Two proprietary nicotine dusts, undiluted crude oil, carbolineum, Flit, and ammonium sulphate all proved more or less inefficient.

OGILVIE (L.). **"Black Tip," a Finger Tip Disease of the Chinese Banana in Bermuda.**—*Phytopathology*, xviii, no. 6, pp. 531–538, 3 figs., 9 refs. Lancaster, Pa., June 1928.

The insects found on the flowers and fruit of *Musa cavendishi* suffering from black tip were a Tineid larva, the Aphid, *Pentalonia nigronervosa*, Coq., the larvae and adults of *Carpophilus* sp., and of *Araecerus fasciculatus*, DeG., and large numbers of *Drosophila ampelophaga*, Lw., but only a mite of the genus *Hypoaspis* was invariably present on both healthy and diseased plants.

Cleare, jr. (L. D.). **Report on the Working of the Biological Division.** —*Rep. Dept. Sci. & Agric. Br. Guiana, 1926*, Appx. v, 10 pp. Georgetown, Demerara, 1927.

In addition to the usual pests of sugar-cane, this crop was attacked by *Remigia punctularis*, Hb. (grass looper), a new and important enemy of which, an undetermined Carabid beetle, was observed during the outbreak. Rice was attacked in its earliest stages by *Laphygma frugiperda*, S. & A., and a little later in the year by *Lissorhoptrus* sp. (rice water weevil), which eats into the roots and causes discolouration of the leaves. Both larvae and pupae were found on examination of the root masses, close under the base of the plant. The best method of control, when applied in the early stages of the attack, was found to be either continuous drying off of the fields for a period of two weeks, or alternate drying and flooding for a week at a time. When the young grain had begun to form, the rice crop was attacked by the Pentatomid, *Mormidea poecila*, Dall., which can be controlled by sweeping with hand nets. The information given in regard to *Diatraea saccharalis*, F., as a pest of rice and its control has already been noticed [*R.A.E.*, A, xvi, 112]. A new pupal parasite of this borer was reared during the year. Stored rice was injured by *Calandra oryzae*, L.

Continued investigations of *Castnia daedalus*, Cram. (coconut moth borer) showed that a female is capable of laying 300 eggs, which under favourable conditions hatch in 16 days. The larval period, though not yet complete, has lasted over 9 months. Cassava was attacked by *Erinnyis ello*, L. (cassava hawk moth), and by the larvae of a fly believed to belong to the genus *Lonchaea*. Maize was attacked by *R. punctularis* and sweet potatoes by *Herse cingulata*, F. (sweet potato hawk moth), *Cylas formicarius*, F. (sweet potato weevil) and the Pyralid, *Megastes pusialis*, Snell.

Neiva (A.). **Os trabalhos da Commissão de Estudo e Debellação da Praga Caféeira, desde seu inicio.** [The Work of the Commission for the Study and Control of the Coffee Pest since its Inception.] —*Pub. Comm. Estudo e Debellação da Praga Caféeira*, no. 21, 27 pp. S. Paulo, 1928.

This paper describes the discovery of the Scolytid, *Stephanoderes hampei*, Ferr., in coffee berries in the State of S. Paulo, Brazil, where it had been imported from Africa in 1913; the establishment of the commission for its study and control; the various measures adopted; and the practical success obtained [*R.A.E.*, A, xv, 30]. The destruction of abandoned coffee plantations has resulted in 1,408,922 coffee bushes being cleared away. Up to June 1927, over 52 million empty coffee bags had been disinfected by fumigation with carbon bisulphide. It is impossible to eradicate the pest, but the infestation has been brought down from 60–90 per cent. to less than 1 per cent.

Myers (J. G.). **The Biological Control of Cotton Pests.**—*Emp. Cott. Grg. Rev.*, v, no. 2, pp. 113–127. London, April 1928.

The principles of biological control are briefly explained. Since 1873, over 40 definite introductions of parasites from one country or region into another have been made, of which about half have given beneficial results. These past successes and failures are discussed, and the more important cotton insects are dealt with from the point of view of the possibilities of biological control. Past experience indicates that biological control, where practicable, is the most economical method of defence against insects attacking plants, and has the advantage of relative permanence. It has great possibilities as regards the cotton industry; the feasibility of augmenting the efficiency of natural enemies already present should be considered as well as the more promising possibility of an interchange of parasites between different cotton-growing countries.

GOLDING (F. D.). **The Control of Cotton Stainers in Southern Nigeria.**—*Emp. Cott. Grg. Rev.*, v, no. 2, pp. 128–133, 9 refs. London, April 1928.

An account is given of the control measures usually prescribed against cotton stainers (*Dysdercus* spp.), which are the principal pests of cotton in Southern Nigeria. Those that have been investigated are briefly reviewed but have been found inefficient, and present observations are tending to show that the only measures likely to be efficacious are those resulting from plant breeding. There are certain late-flowering strains of high quality indigenous cotton that appear promising, and it is hoped that crops can be produced from these at a time when stainers are not numerous. It is hoped also to investigate the possibilities of producing a strain unattractive to stainers.

JOHNSTON (H. B.). **On the Study of Parasitic Insects, and their Economic Importance in the Sudan.**—10 pp., 2 refs. [Khartoum, Wellcome Trop. Res. Lab., 1927.]

This paper includes a general and historical account of parasitism as a whole, and briefly discusses observations made on three parasitic insects in the Sudan: a small Hymenopteron parasitising the egg masses of a plant bug attacking dura [*Sorghum*]; an undetermined Braconid parasitising the larvae of two moths attacking sunt [*Acacia*], of which the more important is *Anadiasa obsoleta*, F.; and *Lathromeris* [*johnstoni*, Wtrst.], a Chalcid egg-parasite of *Sphenoptera gossypii*, Cotes (cotton stem-borer) [*R.A.E.*, A, xiv, 223]. The life-cycle of *L. johnstoni*, the eggs of which are laid in the egg of *S. gossypii* affixed to the bark of the cotton plant, takes about one month, during which time as many as 9 parasites may develop inside the host egg. *L. johnstoni* has been bred from the eggs of the cotton stem-borer on *Dolichos lablab*, *Hibiscus esculentus*, *Abutilon* sp. and other malvaceous plants, as well as from the eggs of an allied stem-borer on *Tephrosia purpurea*, and has been found in most of the cotton-growing districts of the Sudan.

The curve of its occurrence in the Gezira district is regular every season, showing a constant increase from about 3 per cent. in August to 35 per cent. or more in late April, the maximum parasitism being found only under certain optimum conditions. The absence of food-plants of the host, due to the burning of the cotton crop at the end of the season and the scarcity of vegetation during the summer, is probably the direct cause of the low incidence of *Lathromeris* in August. Large numbers of eggs of *Sphenoptera* found on cotton roots left in the ground probably constitute its chief food-supply during June and July. The initial infestation of the cotton crop might be substantially reduced if an increase could be effected in the supply of parasites at the beginning of the season, when the stem-borer causes the greatest amount of injury to the young growth. The distribution and numbers of parasites may be increased by the liberation of large numbers bred in the insectary, and by growing early sown catch crops to attract both the host and its parasites. While the former method allows a count to be made of the numbers liberated and makes possible the elimination of secondary parasites, the latter provides economy of labour.

The possibility of transferring parasites from one host to another is briefly discussed. The Braconid, *Microbracon hebetor*, Say, is sometimes an important parasite of the moth, *Corcyra cephalonica*, Staint., which is a pest of stored seeds. Investigations are being made both with a view to introducing it into stores threatened by invasion by *Corcyra* and to its possible transference to the pink bollworm [*Platyedra gossypiella*, Saund.], either in the resting stage or in the growing boll.

King (H. H.). **Work of the Entomological Section.**—*Rep. 1926–27 Agric. Res. Sudan*, pp. 113–114. London, 1928.

The sunning of cotton seed as a measure against the pink bollworm, *Platyedra* (*Pectinophora*) *gossypiella*, Saund., is now practised in the Sudan on a large scale ; at one ginning station 1,800 tons of seed were dealt with in this way. Mention is also made of observations on parasites [see preceding paper].

Johnston (H. B.). **Pest Report for the Gezira Research Farm for the Season 1926-27.**—*Rep. 1926-27 Agric. Res. Sudan*, pp. 114–117. London, 1928.

The insect pests observed on the Gezira Research Farm, Sudan, in 1926–27 included the cotton thrips [*Heliothrips indicus*, Bagn.], of which there was a general infestation at the beginning of the season, which became more localised in August and was over by the end of March. Termite attack on cotton frequently followed that of the stem-borer [*Sphenoptera gossypii*, Cotes], which caused the death of many trees early in the season though fewer succumbed as they grew older and stronger. Seedling cotton was slightly damaged early in the season by the cotton flea-beetle [*Nisotra uniformis*, Jac.], which continued injurious in certain plots until March and April. The pink bollworm [*Platyedra gossypiella*, Saund.] was not found in January ; in February the infestation reached 3·6 per cent., which was not exceeded throughout the season. The highest percentage of bolls attacked by *Earias insulana*, Boisd. (Egyptian bollworm) during 1926 was 5·9.

Pettey (F. W.). **Removal of Spray Residue from Pears ; Further Experiments in the Removal of Spray Residue from Fruit. Removal of Spray Residue from Pears and Apples.**—*S. Afr. Fruit Gr.*, xv, Jan. 1928, pp. 5, 12–13 & March suppmt., 2 pp. Cape Town, 1928.

As a result of tests with hydrochloric acid for the removal of spray residue on pears [*cf. R.A.E.*, A, xvi, 306], it has been found that susceptibility to the acid varies in different varieties and even in the same variety grown under different conditions. The following treatment effectively removes spray residue and does not damage the mature fruit of Williams and Clapps pears provided sufficient clean water is supplied in the water trough ; it does, however, injure immature fruit.

The fruit is submerged for 3 minutes in 1 per cent. actual HCl, drained for 1 minute and submerged in running water for 4 minutes, or submerged for 1 to 1½ minutes in 2 per cent. HCl, drained for 1 minute and submerged for 2 minutes in clean running water. In some cases it may be desirable to increase the period of submergence in water. The submergence of fruit for 5 minutes in ½ per cent. HCl, followed by draining for ½ or 1 minute and submergence in water for 4 minutes, is less effective in removing all visible traces of arsenic, and sometimes in the case of heavily sprayed graded size Williams pears it failed to reduce the arsenic to 0·01 grain per pound, which is the tolerated amount. Submergence for 2 minutes in 1 per cent. HCl or for 1 minute in 2 per cent. HCl, followed by draining for ½ minute and submergence in clean running water for 2 minutes, is almost as effective as either of the first two methods mentioned and would be sufficiently effective where a light or moderate spray programme is applied. These last two methods are the only safe ones for immature Williams pears ; in these pears the lenticels or breathing pores are open and allow access of the acid solution, as a result of which they collapse and turn black. The fruit should be removed from the containers soon after dipping, particularly if wood-wool is used at the bottom of the receptacles to prevent bruising. It is suggested that the fruit be graded immediately after dipping and any drops of liquid remaining on it be wiped off during this process. Where running water is not available, an ample supply of clean rinsing water is essential. The fruit should not be agitated in the troughs, but the receptacle containing it should be raised once or twice at the beginning of dipping to remove any air bubbles on the surface of the fruit. When pears are treated with 1 per cent. HCl followed by ½ minute draining, at least 4 gals. of water are required for each bushel of fruit containing wood-wool at the bottom, and at least 3 gals. when the wood-wool is omitted. The receptacles must be sufficiently open to allow rapid draining. By the addition of 1 lb. of sodium bicarbonate to every 100 gals. of rinsing water the same amount of water will be sufficient for three times the amount of fruit. Some varieties tolerate more acid in the rinsing water than others. Williams pears will tolerate as much as $\frac{1}{15}$ per cent. acid in the rinsing water provided that after being in the contaminated water they are drenched for about 15 seconds with a liberal supply of clean running water. Red New Year apples were found to resist more than $\frac{1}{20}$ per cent. acid in the rinsing water, which suggests that apples are more resistant than most pears.

The fruit may be packed wet 15 minutes after rinsing. Considerable numbers of trays of Williams and Clapps pears have been packed wet, placed in cold storage for 3 weeks and allowed to ripen without any damage resulting.

Brain (C. K.). **The European Cabbage Webworm** (*Hellula undalis*, **Fabr.**).—*S. Afr. Gdng. & Ctry. Life*, xviii, no. 6, pp. 193–194, 2 figs. Cape Town, June 1928.

Hellula undalis, F., probably introduced into Natal some 15 years ago, has recently caused serious outbreaks in the south-west of Cape Province. The eggs, which are laid on cabbage, kale, turnip, etc., hatch in 3–4 days, and the larvae feed, covered by webs, on the surface of the leaves and stems, until about half-grown, when they bore deeper. The number of generations in a season is not yet known for South Africa. Parasites were observed in the material examined, but do not appear to be of much importance, and the author is convinced that unless immediate steps are taken to deal with the pest, it will become extremely troublesome. Control measures suggested are dipping transplants in lead arsenate, ¼ lb. to 5 gals. water, before planting, and later applying sprays and dusts if necessary. All crop remains from infested land should be destroyed, and crop rotation practised.

DIEUZEIDE (R.). **A propos du cycle évolutif de *Pemphigella follicularia* Pass.**—*C.R. Acad. Sci. Fr.*, clxxxvii, no. 3, pp. 179–180, 1 ref. Paris, 1928.

In Algiers *Pemphigella follicularia*, Pass., forms galls on the lower surface of the young leaves of *Pistacia atlantica* in early spring, batches of young Aphids beginning to appear 10–15 days later. Soon after these emerge, they wander away and each starts a fresh gall on a leaflet. They produce apterous individuals, which in turn give rise to winged ones. These attach themselves to the roots of Graminaceae, where they produce apterous forms. Sexual individuals pass from the grasses to *Pistacia*, on which the winter eggs are laid.

PETRI (L.). **Rapporti fra secrezione di melata e cocciniglie nell' olivo.** [The Relation in the Olive between the Secretion of Honey-dew and Coccids.]—*Boll. R. Staz. Pat. veg.*, vi, no. 1, pp. 40–43, 1 fig., 2 refs. Rome, January 1926.

An example of honey-dew secreted by insects is described from Eritrea on olives, *Olea europaea*, infested by the Coccid, *Chionaspis olivina*, Leon.

PETRI (L.). **La terapia interna nella patologia vegetale.** [Internal Treatment in Plant Pathology.]—*Boll. R. Staz. Pat. veg.*, vii, no. 2, pp. 101–120, 22 refs. Rome, April–June 1927.

The various methods advocated for the internal treatment of plants against pests are briefly discussed [*cf. R.A.E.*, A, xiv, 505, etc.].

SIBILIA (C.). **Le applicazioni delle fumigazioni cianidriche nella patologia vegetale.** [The Employment of Fumigation with Hydrocyanic Acid Gas in Plant Pathology.]—*Boll. R. Staz. Pat. veg.*, vii, no. 2, pp. 182–194, 13 refs. Rome, April–June 1927.

Fumigation with hydrocyanic acid gas should be based on a knowledge of the quantity of gas required for a given space to be treated, but only in one instance of large-scale work has this figure been given, volumes of 0·30–0·35 per cent. for *Lepidosaphes* [*beckii*, Newm., and *gloveri*, Pack.] and 0·15–0·20 per cent. for *Chrysomphalus* [*dictyospermi*, Morg.] being found to be fatal at 10–15° C. [50–59° F.] during work in Spain against pests of *Citrus*. Experiments are now being conducted in Rome in order to obtain precise data for fumigation with hydrocyanic acid gas and for establishing regulations for its use. The work has not been finished, but some results can be recorded. The amounts of HCN found in various fruits and nuts fumigated are given. *Pseudococcus grassii*, Leon., on bananas was destroyed within the bunches in their original packing by exposure for 1½ hours to a concentration of 1·5 gms. per cubic metre. In treating oranges, exposure for 1 hour to a concentration of 2·38 gms. per cubic metre killed *Lepidosaphes pinnaeformis*, Bch., and its larvae. Experiments with pineapples showed that the pulp was not affected by the gas.

PULSELLI (A.). *Microcera coccophila* **Desm. (1848).**—*Boll. R. Staz. Pat. veg.*, vii, no 3, pp. 300–329, 13 figs., 26 refs. Rome, July–September 1927.

An account is given of the morphology and development of *Microcera coccophila*, and previous work on this entomogenous fungus and its use in the control of harmful insects is reviewed. The problem of employing such fungi against insect pests must remain unsolved until it becomes possible rapidly to initiate and spread epidemics.

TOPI (M.). **La lotta contro la filossera gallecola della vite.** [Work against the Gall Form of the Vine *Phylloxera*.]—*Boll. R. Staz. Pat. veg.*, vii, no. 4, pp. 367–381. Rome, October–December 1927.

The leaf-gall form of the vine *Phylloxera* is unimportant as regards European vines because few galls occur on them, but on American vines, which are grown for stocks, the production of wood is decreased, and some grape-producing hybrids are also infested. The gall infestation originates with the form hatched from the winter egg laid by the female beneath the bark of vines that are two or three years old. Thus the formation of galls is related to the sexual forms and, ultimately, to their parents, the winged forms. For many years the sole remedy employed against the winter egg was the mixture devised by Balbiani for painting on the stocks and on the bases of the branches. This contains 20 parts heavy tar oil, 60 parts naphthalene, 120 parts quicklime, and 400 parts water. Sluicing the stock with boiling water may also be employed, but both these methods are expensive and are only suitable for vineyards of grape-producing vines.

Two other methods are suitable for nurseries of American stocks, the second being also applicable to grape-producing hybrid vines. The first consists in causing the winter eggs to rot by burying the stock in winter, preferably with clay soil. The effect is enhanced by so pruning the vine that it is entirely or almost entirely covered. Gall infestation cannot occur if no parts are uncovered to give shelter to the winter egg. In experiments made by the author, the shoots were allowed to push their way through the cover. The consequent delay in growth is no disadvantage in a southern climate. Instead of this method of destroying the winter eggs, it is possible to combat the gall-forming individuals that hatch from them by removing the very young leaves bearing the first galls. Even in Sicily, where winter eggs abound, this collection and destruction of the first galls results in an almost total check of the infestation; the galls that escape collection are too few to injure the plant. This method, however, fails if collection is delayed until the second generation of the gall form has hatched.

In an addendum the author refers to the experiments made in Switzerland by Faes against the gallicolae [*R.A.E.*, A, xvi, 101] and points out that the treatment used does not differ very much from that of Balbiani or from the hot-water method, so that the same remarks apply to it.

PAOLI (G.). **Casi fitopatologici osservati in Liguria nella primavera-estate 1927.** [Phytopathological Cases observed in Liguria in the Spring and Summer of 1927.]—*Boll. R. Staz. Pat. veg.*, vii, no. 4, pp. 382–387. Rome, October–December 1927.

In various parts of the Italian Riviera *Ceratitis capitata*, Wied., was injurious on peaches and apricots and *Anarsia lineatella*, Zell., on peaches. *Aulacaspis* (*Diaspis*) *pentagona*, Targ., was common on peaches, mulberries, etc., but its parasite, *Prospaltella berlesei*, How., is present and capable of controlling it. Oranges were attacked by *Pseudococcus adonidum*, L. (*longispinus*, Targ.), with which the less injurious *Ceroplastes sinensis*, Del Guerc., is nearly always associated. *Cryptolaemus montrouzieri*, Muls., was imported from France three years previously to combat *P. adonidum*, but does not appear to have become numerous, although it is established. *Chrysomphalus dictyospermi*, Morg., occurs everywhere on the ornamental palm, *Phoenix canariensis*. *Icerya purchasi*, Mask., is widely distributed, but is kept down by *Novius cardinalis*, Muls. During the past summer 303 batches of this Coccinellid were despatched to various localities in Italy. *Aphelinus mali*, Hald., introduced into Liguria in 1923, has also become acclimatised, and is fairly effective against *Eriosoma lanigerum*, Hausm. *Liothrips* (*Phloeothrips*) *oleae*, Costa, is not so harmful now to olives as it was a few years ago, but *Prays oleellus*, F., and *Dacus oleae*, Gmel., continue to be very injurious ; the last-named destroyed almost the whole of the Ligurian olive crop.

Insect pests of the flower industry have not been important, with the exception of the rose Buprestid, *Coraebus rubi*, L. Carnations are sometimes badly attacked by *Tortrix pronubana*, Hb. Sea-water and sprays of sulphur and lime are used against *Tetranychus telarius*, L. *Crioceris asparagi* var. *macilenta*, Weise, injured asparagus, and *Cidaria* (*Larentia*) *fluviata*, Hb., attacked basil [*Ocimum*].

PETRI (L.). **Esperienze sopra alcuni mezzi di disinfezione delle castagne destinate all'esportazione.** [Experiments on some Methods for disinfesting Chestnuts intended for Export.]—*Boll. R. Staz. Pat. veg.*, vii, no. 4, pp. 388–411, 3 figs. Rome, October–December 1927.

The condition of Italian chestnuts intended for export is a serious problem, especially in view of complaints from the United States, which take half of the total quantity exported, about 11,000 tons going to New York alone. Besides moulds, the Tortricid, *Cydia* (*Carpocapsa*) *splendana*, Hb., and the weevil, *Curculio* (*Balaninus*) [*elephas*, Gyll.], are constant pests. As a result of experiments, it was found that soaking the infested chestnuts in water kills all the larvae if prolonged for six days, but rotting is favoured thereby and the germination qualities are affected. Fumigation with hydrocyanic acid gas was the subject of several tests in a chamber enabling a partial vacuum to be maintained. The quantity of gas needed to kill the larvae of the two pests in chestnuts is 3·5–3·8 gms. per cubic metre. The capacity of the chamber requires to be about twenty times the volume of the chestnuts to be disinfected in order to prevent an excessive decrease in the strength of the gas owing to its absorbtion by the chestnuts ; the latter can absorb about 0·06–0·07 gms. per kg. in ten hours, with a partial vacuum of 20 cm. of mercury, provided that they are exposed. This last condition renders the spreading of chestnuts in layers on gratings one of the essential factors in efficient fumigation. While the larvae can be killed when the chestnuts contain 0·022 gms. per kg., the certainly fatal dose is 0·05 gms. if the treatment lasts ten hours in a vacuum of 20 cm. of mercury. It is probable that an increase of the vacuum would reduce the time required. After treatment the chestnuts must be subjected to a second vacuum of 50 cm. for 20 minutes ; they will then yield 65 per cent. of the HCN they contain. This treatment and subsequent exposure to free air render the HCN content negligible in toxicity if the chestnuts are eaten after being cooked. Fumigated chestnuts stored in hermetically sealed containers yield one-seventh of their HCN content. This quantity is innocuous in storage or in the holds of steamers provided there is sufficient ventilation.

PETRI (L.). **Formazione prevalente di frutti ipoplastici dell'olivo per causa parassitaria** [The Development of malformed Fruits in the Olive caused by Parasites.]—*Boll. R. Staz. Pat. veg.*, vii, no. 4, pp. 447–454, 2 figs. Rome, October–December 1927.

A considerable loss of crop among Ligurian olives was due to large numbers being misshapen and abnormally small, owing to infestation by the Coccids, *Saissetia oleae*, Bern., and *Lepidosaphes ulmi*, L. Sprays of lime-sulphur or a solution containing caustic soda and heavy tar-oil are advocated against them.

PETRI (L.). **Rassegna dei casi fitopatologici osservati nel 1927.** [Survey of Phytopathological Cases observed in 1927.]—*Boll. R. Staz. Pat. veg.*, viii, no. 1, pp. 1–50. Rome, January–March 1928.

The insect pests observed in Italy in 1927 included the following : *Lygus spinolae*, Meyer, on the leaves of grape-vines ; *Prays oleellus*, F., *Liothrips* (*Phloeothrips*) [*oleae*, Costa] and *Lepidosaphes ulmi*, L., on olive ; *Agrilus sinuatus*, Ol., *Stephanitis pyri*, F., *Hoplocampa brevis*, Klug, and *Cydia* (*Laspeyresia*) *pomonella*, L., on pears ; *Eriosoma lanigerum*, Hausm., on apples ; *Capnodis tenebrionis*, L., on peaches ; *Pseudococcus citri*, Risso, *Icerya purchasi*, Mask., and *Lepidosaphes pinnaeformis*, Bch., on *Citrus* ; *Thaumetopoea* (*Cnethocampa*) *pityocampa*, Schiff., and *Rhyacionia* (*Evetria*) *buoliana*, Schiff., on pines ; *Enarmonia* (*Steganoptycha*) *diniana*, Gn., on larches ; *Monarthropalpus buxi*, Lab., on box ; *Aulacaspis* (*Diaspis*) *pentagona*, Targ., on mulberry; *Limothrips cerealium*, Hal., or *Aptinothrips rufus*, Gmel., and *Pentaphis trivialis*, Pass., on wheat ; *Pieris napi*, L., and *Barathra* (*Mamestra*) *brassicae*, L., on rape and cabbage ; *Tetranychus telarius*, L., on egg-plant ; *Larinus scolymi*, Ol., on artichoke ; and *Cleonus luigionii*, Sol., on beet.

PAILLOT (A.). **Importance relative des facteurs divers contribuant à limiter l'extension de la pyrale du maïs dans l'Est de la France.**—*C.R. Acad. Sci. Fr.*, clxxxvii, no. 2, pp. 149–151. Paris, 1928.

The damage to maize by *Pyrausta nubilalis*, Hb., in eastern France is relatively slight, chiefly owing to the fact that the stalks, in which the insect shelters, are fed to cattle. Biological control by parasites is of minor importance. Among the natural enemies of the pest, insects are of more value than certain protozoa recently recorded [*R.A.E.*, A, xv, 654]. The most widely distributed parasite is *Eulimneria crassifemur*, Thoms., though, owing to its high rate of mortality, the proportion of larvae of *P. nubilalis* destroyed by it seldom exceeds 7 per cent. *Microbracon brevicornis*, Wesm., is principally found where large areas are under maize, the proportion of larvae destroyed by it ranging from 5 to 10 per cent. Tachinid flies, of which *Zenillia roseanae*, B. & B., has alone been determined, are found chiefly in the Rhône valley. The percentage of larvae parasitised by them is very variable. Where these flies are plentiful, *E. crassifemur* is extremely scarce.

SPRENGEL (L.). **Versuche zur Rationalisierung der Heu- und Sauerwurmbekämpfung im pfälzischen Weinbau.** [Experiments to place Work against the Spring and Summer Generations of the Vine-moths on a rational Basis in the Rhine Palatinate.]—*Der Deutsche Weinbau*, 1928, reprint, 6 pp., 4 figs. Karlsruhe, 1928.

The great severity of the outbreak of the vine-moths [*Clysia ambiguella*, Hb., and *Polychrosis botrana*, Schiff.] in the Rhine Palatinate in 1925 was due to the very large spring generation and to the promiscuous, prolonged occurrence of all developmental stages of that generation, followed without an interval by a similar occurrence of the summer generation. The observations made in 1925 show that the beginning, duration and intensity of the flight vary markedly in different localities. Spraying with arsenicals must not be delayed until the attack becomes evident ; it must be preventive in character and must ensure the first larvae being destroyed. To meet the danger of the generations overlapping, the usual summer nicotine spray is best combined with an arsenical. As the date of spraying is of prime importance, various methods for ascertaining it were tried, the most satisfactory being the use of a bait for catching the moths, such as sour wine with the addition of sugar and vinegar, in glass jars.

TESCH (B.). **Schädlingsbekämpfung in Gewächshäusern mittels "Cyanogas."** [The Control of Pests in Greenhouses by Means of Cyanogas.]—*NachrBl. deuts. PflSchDienst*, viii, nos. 5 & 6, pp. 37–39, 49–52, 3 figs., 8 refs. Berlin, May–June 1928.

The employment of calcium cyanide dust (Cyanogas A) for greenhouse fumigation is described, and its advantages over the pot method of generating hydrocyanic acid gas are emphasised. The German regulations regarding the use of this gas have been notably relaxed in respect of preparations such as calcium cyanide, provided that fumigation is limited to greenhouses detached from dwelling houses.

SCHMIDT (M.). **Der Marienkäfer** *Exochomus quadripustulatus* **L. ein Feind der Blutlaus** (*Eriosoma lanigerum* **Hausm.**). [The Coccinellid, *E. quadripustulatus*, an Enemy of the Woolly Aphis, *E. lanigerum*.]—*NachrBl. deuts. PflSchDienst*, viii, no. 6, pp. 52–53. Berlin, June 1928.

During the late summer and autumn of 1927 the Coccinellid, *Exochomus quadripustulatus*, L., was noticed in abundance on apple trees in two localities in Germany, where *Eriosoma lanigerum*, Hausm., was numerous. The beetles were seen to oviposit in the colonies of the Aphid, on which the larvae feed. As *E. quadripustulatus* hibernates, usually gregariously, under the bark-scales of apple, it remains to be seen if the scraping practised against various pests will affect its numbers.

[Vukasović] Voukassovitch (P.). **Observations biologiques sur** *Rhodites rosae* **L. et ses parasites.**—*C.R. Soc. Biol.*, xcviii, no. 13, pp. 1148–1150. Paris, 27th April 1928.

From galls on rose-trees formed by *Rhodites rosae*, L., in the Belgrade district, the following parasites of this insect have been taken: *Orthopelma luteator*, Grav.; *Torymus bedeguaris*, Nees; *T. macropterus*, Wlk.; *Oligosthenus stigma*, F.; *Habrocytus bedeguaris*, Thoms., and *Eurytoma rosae*, Nees. It was observed that from galls containing *Periclistus brandti*, Ratzb., which has been regarded as existing symbiotically with *R. rosae*, none of the latter emerged.

[Vukasović] Voukassovitch (P.). **Sur deux Chalcidiens, parasites de Diptères dont les larves minent les feuilles des plantes.**—*C.R. Soc. Biol.*, xcviii, no. 13, pp. 1150–1152. Paris, 27th April 1928.

Observations made near Belgrade are recorded on *Solenotus viridis*, Först., and *Chrysocharis elongatus*, Thoms., parasites of the larvae of the Diptera, *Phytomyza geniculata*, Macq. (*syngenesiae*, Hardy) and *P. atricornis*, Mg., which mine the leaves of *Sonchus*, and *Agromyza* sp. in leaves of lucerne.

Finţescu (G. N.). **Observations biologiques et contributions à la biologie de la mouche à scie des rosiers** (*Hylotoma rosae* **D.G.**). – 15 pp. Jassy, 1928.

An account is given of the method of oviposition of *Arge* (*Hylotoma*) *rosae*, L., which is a pest of rose in Rumania, with some notes on its biology and its parasite, *Pteromalus hylotomae* [*R.A.E.*, A, xvi, 3].

Oehlers (H.). **Forsög med Rygning med Blaasyre (Cyanbrinte) i Vaeksthuse.** [Experimental Fumigation with Hydrocyanic Acid Gas in Greenhouses.]—17 pp., 5 figs. Copenhagen, 1927. (Abstract in *Z. PflKrankh.*, xxxviii, no. 5–6, pp. 190–191. Stuttgart, May–June 1928.)

The fumigation of greenhouses with hydrocyanic acid gas has been studied under conditions obtaining in Denmark. The dosages suitable for over one hundred plants and for various kinds of pests are indicated.

Lundblad (O.). **Skadedjur i Sverige år 1927.** [Pests in Sweden in 1927.]—*Medd. CentAnst. Försöks. Jordbr.*, no. 337, Lantbruksentom. avdel. no. 54, 33 pp., 1 map. Stockholm, 1928.

This is an annotated list of the more important agricultural pests occurring in Sweden in 1927, arranged systematically and including some 130 species of insects.

[KOROTNEV (N. I.).] **Коротнев (Н. И.). The Bark-beetles of the Russian Forests and their Control.** [*In Russian.*]—8vo, 188 pp., 155 refs. Moscow, Novaya Derevnya, 1926. Price 1 *r.* 50 *k.*

This publication forms part 10 of a proposed series on the ecology of beetles of Eastern Europe, the Caucasus and Siberia and deals with the Scolytids and Platypodids. It is divided into three parts, the first consisting of a discussion of the methods of making systematic and ecological collections of bark-beetles, general observations and a review of remedial measures, including notes on those applicable to species attacking various trees. The second part deals with the individual beetles, describing their bionomics and distribution, while the third part is a reprint of a paper by I. L. Serbinov on the methods of collecting fungous, protozoal and bacterial diseases of insects [*R.A.E.*, A, iii, 95].

[VLADIMIRSKIĬ] WLADIMIRSKY (A. P.). **Versuch einer quantitativen Zählung der Beerenfauna. (Materialien zu einer quantitativen Zählung der Fruchtfauna.)** [Quantitative Investigations of the Fauna of Berries. (Material for a quantitative Investigation of the Fauna of Fruit.)]—*Z. Morph. Oekol. Tiere*, xi, no. 1–2, pp. 235–246, 5 figs., 6 refs. Berlin, 3rd July 1928.

A study was undertaken near Leningrad to determine the fauna of the fruit of strawberry, raspberry, bilberry and mountain ash. The average number of insects and mites obtained from any 10 berries was 4 on strawberry, 10 on bilberry, 66 on mountain ash, and 71 on raspberry. In all cases mites preponderated.

CORBETT (G. H.) & DOVER (C.). **Some general Remarks on the Influence of Climatic Conditions on the Prevalence of Economic Insects in Malaya.**—*Malayan Agric. J.*, xvi, no. 1, pp. 1–7, 3 figs., 1 ref. Kuala Lumpur, January 1928.

Observations, the results of which are briefly discussed, are recorded on the effect of climatic conditions on 38 species of insects in Malaya, where there is no marked wet or dry season, or even summer and winter. In spite of the general uniformity of the climate, wind, rainfall and humidity have an undoubted influence on certain insects, though in a much less degree than in most other countries, and may possibly lead to the appearance or disappearance of a pest. Thus the cessation of outbreaks of *Artona catoxantha*, Hmps. (coconut Zygaenid) is undoubtedly influenced by wind and rain, which washes away a large number of the larvae. It appears that most insects of economic importance are commoner during, or just after, the wet weather than in the dry season, though a heavy rainfall such as occurs in April and November, which is usually accompanied by strong winds, is generally detrimental to the prevalence of insect life.

PETCH (T.). **Studies in Entomogenous Fungi. xii.** *Peziotrichum lachnella*; *Ophionectria coccorum*; *Volutella epicoccum.* **xiii.** *Glenospora.*—*Trans. Brit. Mycol. Soc.*, xii, pt. 1, pp. 44–52, 1 pl., pt. 2–3, pp. 105–113. Cambridge, 19th March and 30th June 1927.

The three fungi dealt with in the first of these papers are remarkably similar, and some genetic relation between the first two has been established. *Peziotrichum lachnella* is parasitic on *Pinnaspis* (*Hemichionaspis*) *aspidistrae*, Sign., and *Aonidia* sp. in Ceylon and on a Diaspid on *Bambusa* in Malabar; and *Ophionectria coccorum*, sp. n., on *Fiorinia juniperi*, and *Volutella epicoccum*, sp. n., on *Parlatoria aonidiformis*, Green, and another Coccid, possibly *Lecanium* sp., in Ceylon. The genus *Glenospora*, parasitic on scale-insects, is discussed from the systematic standpoint.

BEESON (C. F. C.). **The Defoliation of Teak.**—*Ind. For.*, liv, no. 4, pp. 204–215, 1 pl. Allahabad, April 1928.

A list is given of the insects defoliating teak in India, of which the most important are *Hyblaea puera*, Cram., *Hapalia* (*Pyrausta*) *machaeralis*, Wlk., and *Diacrisia obliqua* var. *confusa*, Butl. [*cf.* *R.A.E.*, A, xiv, 326]. The life-cycles of the first two moths are of less than a month's duration. In South India there are 13–15 generations a year, with no resting period either in winter or summer; in the Central Provinces there are fewer broods, owing to aestivation in hot weather and retarded development in cold weather. In north-west India definite hibernation occurs, *Hyblaea puera* overwintering as an adult and *Hapalia machaeralis* as a larva.

There is great variability in the distribution and intensity of defoliation in different parts of the forest at one and the same time, and in order to obtain more accurate information, records are now being made from month to month throughout the year. These already give interesting indications of the natural genesis and development of epidemics and will probably explain the relative susceptibilities of localities and of groups of trees of various ages. Two series of records are given as examples.

Restriction of damage, once the epidemic stage has been reached, is not considered practicable under the present conditions of forest management, and the aim of the measures recommended is to prevent or reduce the frequency of epidemics. After the leaf-fall of teak, the numbers of larvae are greatly reduced by lack of food, and the leafless period can be artificially prolonged by the suppression of all adventitious growth, the destruction of alternate food-plants (*H. puera* feeds on *Vitex negundo* and some Bignoniaceae) and by not planting teak trees in sites where they will come into leaf before the average date for the locality. Young leaves are essential to the newly hatched larvae of *H. puera*, which cannot survive on the tougher leaves, and it is therefore important that the canopy should develop and close up rapidly. The destruction of foliage by subsidiary pests, when it stimulates the production of new foliage, favours the multiplication of the primary species. On the other hand the skeletonisation of the older leaves by *Hapalia* and *Diacrisia*, when it occurs late in the season and is not immediately followed by leaf-shedding, may be beneficial by lengthening the period when no food is available. Prolonged and rainless hot weather favours the pests, while early intermittent rainfall reduces their numbers. The larvae of *Hyblaea puera* are subject to attack by a bacterial disease the spread of which is associated with high atmospheric humidity. *Hapalia machaeralis* suffers from the mechanical effect of rain and the oviposition of both species is checked by it. During the monsoon, defoliation by caterpillars is replaced by the attacks of grasshoppers, cockchafers and weevils, which are hardier.

The author does not consider that the artificial increase of the predacious enemies of these caterpillars would have any appreciable effect, except in the case of purely insectivorous birds and of ants in regeneration areas and very young plantations. On the other hand, it is very desirable to increase the rate of parasitism. This may be accomplished by discovering the alternate hosts of parasites and propagating them by introducing or favouring the plants on which they feed; and by introducing parasites from other localities. The ideal type of parasite would be one that attacked the defoliator of a shrub or tree suitable for introduction into teak plantations as an underwood or along roads, paths and river banks; and one whose alternate host is available when the incidence of *Hyblaea* and *Hapalia* on teak is reduced to a minimum. It is unlikely under forest conditions in India that parasites could be bred in a field insectary and liberated when required, but the maintenance of the supply automatically in a natural parasite reserve is within the bounds of practical silviculture.

The methods of estimating the loss of increment due to defoliation are discussed.

DHARESHWAR (S. S.). **An Experiment in Lac Propagation in the Badami Range, Dharwar-Bijapur Division, Bombay.**—*Ind. For.*, liv, no. 4, pp. 235–241. Allahabad, April 1928.

Towards the end of 1926 a natural growth of lac was found in the forests of the Badami range, Bombay. The insect concerned was the true *Laccifer* (*Tachardia*) *lacca*, Kerr, and experiments to investigate the possibility of lac propagation on a commercial scale are described. The climate, soil conditions and nature of the tree growth in this locality seem to be favourable to lac cultivation. The hot winds in summer the uncertainty of the rains, and the fact that some of the food-plants are vegetatively inactive during the latter part of the summer make it difficult to produce a summer crop of lac, and it is possibly these factors rather than the presence of predators that prevent the continual propagation of lac growing naturally in the forest. If the present experiment succeeds, areas will be selected where the moisture content of the soil is conserved until late in the summer and the trees are consequently capable of producing a summer brood.

TURNER (A. J.) & SEN (D. L.). **The Use of Hydrocyanic Acid Gas for the Fumigation of American Cotton on Import into India.**—*Mem. Dept. Agric. India*, Ent. Ser., x, no. 5, pp. vi+69–166, 6 pls., 7 figs., 101 refs. Calcutta, January 1928.

The following is largely taken from the authors' summary: Descriptions are given of extensive experiments undertaken to ascertain the conditions necessary for the satisfactory fumigation of cotton with hydrocyanic acid gas, since it was feared that *Anthonomus grandis*, Boh. (Mexican boll-weevil) might be introduced into India in bales imported from America. Most of the experiments were carried out on a small scale in the laboratory, in others a single bale of cotton was used, and experiments were also made on a practical scale using barges. The apparatus is described in detail and the sources of error fully discussed. In India the experiments were confined to *Calandra* (*Sitophilus*) *oryzae*, L., but arrangements were made with authorities in America to repeat the work using *A. grandis* itself.

It was concluded that to ensure the extermination of *C. oryzae* under conditions in Bombay, it is sufficient to expose the weevils for a period of 20 hours to a concentration of 150 parts HCN to 100,000 parts by volume (calculated as at normal temperature and pressure). They were found to be much more susceptible to the gas at higher than at lower temperatures, there being a marked increase in susceptibility above 86° F. From an examination of results obtained with *A. grandis* it appears that there is not a great difference in the susceptibility of the two insects and that the susceptibility of *A. grandis* is also affected by temperature ; if anything, *A. grandis* is more sensitive than *C. oryzae*, at any rate to exposure for a comparatively short time to high concentrations of the gas. Under conditions in Bombay it is concluded that *A. grandis* would be exterminated by an exposure of 4 hours to a concentration of 450 parts HCN to 100,000, or for 20 hours to a concentration of 150. It is further concluded that that the best procedure for work on a practical scale is to combine a short fumigation (6 hours) at a high concentration with a long fumigation (a further 12–14 hours) at a lower concentration, the minimum concentration for the second period being not less than 200 parts to 100,000.

Further experiments showed that cotton, whether loose or baled, absorbs HCN, damp cotton being rather more absorbent than dry cotton, the difference in absorption for extremes of humidity being about 50 per cent. of the dry absorption. Between 86 and 104° F. the actual temperature has very little influence on absorption. The HCN absorbed is given off fairly rapidly and there is no evidence that any irreversible chemical combination occurs. With water added to both the acid and sodium cyanide used for generating the gas, the amount of sodium cyanide required for satisfactory fumigation is about 0·05 per cent. of the weight of the cotton (about 0·1 per cent. being necessary when water is not present), but where leakage has to be contended with, the weight of sodium cyanide required is about 0·07 per cent. of the weight of the cotton, or 1 lb. of sodium cyanide for 3 bales of cotton. Subsequent experience on a practical scale has shown, however, that 1 lb. sodium cyanide is sufficient for the satisfactory fumigation of 5 bales, when good barges are used and the bales are dry and compressed to a high density.

It was found that jute absorbs twice as much HCN as cotton at a more rapid rate. The absorptive power remains practically the same between 86 and 104° F., but is slightly greater for damp jute than dry.

As a result of these experiments the Government of India issued a Notification under the Destructive Insects and Pests Act, 1914, requiring all imported American cotton to be subjected to fumigation with HCN and confining such importation and fumigation to the port of Bombay. The experience accumulated since the application of this Notification to the fumigation of over 80,000 bales in barges, has amply confirmed the conclusions previously reached as to the absorptive capacity of cotton bales.

Ramakrishna Ayyar (T. V.). **A Contribution to our Knowledge of South Indian Braconidae. Pt. I. Vipioninae.**—*Mem. Dept. Agric. India*, Ent. Ser., x, no. 3, pp. 29–60+6, 10 pls., numerous refs. Calcutta, January 1928.

This is the first part of a systematic account of the Braconids so far recorded in Southern India, with some notes on their biology. The new forms described include: *Aphrastobracon alcidiphagus*, sp. n., reared from *Alcides affaber*, Fst.; *Tropobracon luteus*, Cam. var. *indica* n., from *Schoenobius bipunctifer*, Wlk. (*incertellus*, Wlk.); *Microbracon incarnatus*, sp. n., from *Dactylethra candida*, Stt., on *Tephrosia purpurea*, a valuable green manure plant; *M. melleus*, sp. n., from *Crocidolomia binotalis*, Zell.; and *M. chilocida*, sp. n., from *Chilo simplex*, Butl.

The relationship of the various forms of *Microbracon* attacking bollworms in India is doubtful. In the author's opinion they may provisionally be given specific rank as follows: the Punjab form on *Earias*, which is the melanic form described by Brues in a paper already noticed [*R.A.E.*, A, ix, 215], as *M. lefroyi*, D. & G.; the common form, which includes all the examples of *Microbracon* reared on *Earias* spp. in South India and lac, as *M. tachardiae*, Cam., which may be a synonym of *M. greeni*, Ashm.; and the parasite on *Platyedra gossypiella*, Saund. (pink bollworm) and *Phthorimaea blapsigona*, Meyr., a pest of brinjal [*Solanum melongena*], as *M. gelechidiphagus*, sp. n.

NAWA (U.). *Sitones japonicus*, **Roel., attacking the Roots of** *Astragalus sinicus*. [*In Japanese.*]—*Insect Wld.*, xxxii, pp. 188–191. Gifu, June 1928.

The weevil, *Sitona* (*Sitones*) *japonica*, Roel., is a pest of the roots of *Astragalus sinicus*, a green manure plant; a description of the larva is given.

MURATA (J.). **Results of Control Experiments against** *Larinus griseopilosus*, **Roel.** [*In Japanese.*]—*Insect Wld.*, xxxii, pp. 191–196. Gifu, June 1928.

In the Nagano Prefecture the larvae of the weevil, *Larinus griseopilosus*, Roel., feed on the flowers of *Arctium lappa*. It has one generation a year, wintering as an adult. A spray of lead arsenate and lime is recommended.

MURATA (J.). *Stephanus* **sp. infesting Willows.** [*In Japanese.*]—*Insect Wld.*, xxxii, pp. 227–233. Gifu, July 1928.

A Tingid, *Stephanus* sp., causes serious damage to young willows. There is one generation a year, hibernation occurring in the adult stage. The eggs are laid in the young tissues of the food-plant in June and hatch in July, the adults appearing in August.

ISHII (T.). *Enargopelte ovivora*, **a new Chalcid-fly from Japan.**—*Kontyu*, ii, no. 4, pp. 205–208, 1 pl. Tokyo, May 1928.

The Chalcid, *Enargopelte ovivora*, sp. n., is a parasite of *Lecanium* sp. on *Celtis sinensis* in Japan. It has one generation a year and hibernates in the pupal stage, the adults appearing in the middle of April. About 10 eggs are laid under the body of the female scale and hatch in about a week. The larvae feed on the eggs of the host and are mature in about 20 days.

Kono (H.). **The Life-history and Parasitic Habits of** *Paradeporaus parasiticus* **Kono.** [*In Japanese.*]—*Dobuts. Zasshi* [*Zool. Mag.*], xl, no. 472, pp. 40–44. Tokyo, February 1928.

In Sapporo, *Byctiscus venustus*, Pascoe, rolls the leaves of various species of *Acer*, and *B. congener*, Jekel, the leaves of *Tilia japonica* and *Betula japonica*, for oviposition. Another weevil, *Paradeporaus parasiticus*, Kono, occurs as a parasite in the rolled leaves.

Shinji (O.). **Notes on the Synonyms of Aphididae.** [*In Japanese.*]—*Dobuts. Zasshi* [*Zool. Mag.*], xl, no. 472, pp. 55–57. Tokyo, February 1928.

Anuraphis piricola, Okam. & Tak., of which *Sappaphis pyri*, Mats., and *Anuraphis artemirhizus*, Shinji, are synonyms, passes the winter on pear and the summer on the roots of *Artemisia*, the autumn migrants appearing from the end of September onwards. *Aphis glycines*, Mats. (*justiceae*, Shinji) passes the winter on *Justicea procumbens* and the summer on soy-beans.

Papers noticed by Title only.

Hatton (R. G.), Amos (J.) & Tydeman (H. M.). **The Control of Big Bud Mite** [*Eriophyes ribis*, **Nal.**] **in the Field.**—*J. Pomol. & Hortic. Sci.*, v, no. 2, pp. 124–130, 1 pl., 2 refs. London, March 1926. [See *R.A.E.*, A, xiv, 52.]

Bagnall (R. S.) & Harrison (J. W. H.). **The British Species of the Chalcidid Genus** *Harmolita* **(Hymenoptera) as indicated by their Galls.**—*Ent. Rec.*, xl, no. 5, pp. 68–69, 1 ref. London, May 1928.

Wainwright (C. J.). **The British Tachinidae (Diptera).**—*Trans. Ent. Soc. Lond.*, lxxvi, pt. 1, pp. 139–254, 2 pls., 4 figs. London, 18th August 1928.

Senior-White (R.). **Catalogue of Indian Insects. Part 15.— Cecidomyidae.**—23 pp. Calcutta, Govt. Pub. Branch, 1928. Price *As.* 7 or 9*d.*

[John (O. I.).] **Иoн (O. И.). Keys to Insects of U.S.S.R. Thysanoptera.** [*In Russian.*]—8vo, 72 pp., 41 figs., 12 refs. Leningrad, Défense des Plantes, 1928. Price 1*r.* 50*k.*

[Vorontzovskiĭ (P. A.).] **Воронцовский (П. А.). On the Question of Homological Ranges of Colour Variation in Acrididae.** [*In Russian.*]—*Izv. Orenburgsk. Stantz. Zashch. Rast.* [*Bull. Orenburg Plant Prot. Sta.*], pt. 1, pp. 27–39, 11 refs. Orenburg, 1928.

Shinji (O.). **Notes on the Reproduction of Aphididae.** [*In Japanese.*] —*Dobuts. Zasshi* [*Zool. Mag.*], xl, no. 472, pp. 37–40. Tokyo, February 1928.

Gillette (C. P.) & Palmer (M. A.). **Notes on Colorado Aphididae.** [14 spp., including 9 spp. n.]—*Ann. Ent. Soc. Amer.*, xxi, no. 1, pp. 1–24, 4 pls., 6 refs. Columbus, Ohio, March 1928.

Luginbill (P.). **The Beetles of the Genus** *Phyllophaga* [*Lachnosterna*] **inhabiting South Carolina.**—*Ann. Ent. Soc. Amer.*, xxi, no. 1, pp. 47–91, 36 figs., 8 refs. Columbus, Ohio, March 1928.

Cathcart (C. S.) & Willis (R. L.). **Analyses of Materials sold as Insecticides and Fungicides during 1927.**—*Bull. New Jersey Agric. Expt. Sta.*, no. 459, 16 pp. New Brunswick, N.J., October 1927.

TANAKA (K.). **Studies on Pyralids feeding on Graminaceous Plants in Japan, I and II.** [*In Japanese.*]—*J. Plant. Prot.*, xv, nos. 5 & 6, pp. 289–295, 343–350. Tokyo, May & June 1928.

Pyrausta nubilalis, Hb., has three generations a year in central Japan. The larvae become dormant at about 45° F. and hibernate in the stalks of the food-plants, which include maize, *Sorghum*, *Setaria italica* var. *germanica*, *Panicum* spp., *Polygonum blumei* and other graminaceous plants.

Scirpophaga auriflua, Zell., has two generations a year, hibernating as a larva in the stalks of the food-plants, which are *Miscanthus sinensis* in Japan and sugar-cane in the Loochoo islands.

Schoenobius bipunctifer, Wlk. (*incertellus*, Wlk.) and *Chilo simplex*, Butl., are borers in rice. The latter also attacks a variety of graminaceous plants as well as *Typha latifolia*.

KATO (M.). **Studies on** *Dacus cucurbitae*, **Coq.** [*In Japanese.*]—*J. Plant Prot.*, xv, no. 6, pp. 356–365. Tokyo, June 1928.

Dacus cucurbitae, Coq., of which *D. yayeyamanus*, Mats., appears to be a synonym, is found in Formosa and the Loochoo islands. In Formosa it is very common, causing serious damage to cucumber, *Luffa aegyptiaca* and other cucurbits, and also infests beans and tomatos. Mating takes place about 15 days after emergence and oviposition 5 or 6 days later. The females oviposit several times, 8–20 eggs being laid at one time. Complete development requires about a fortnight in summer and 2 months in winter, and about 8 generations may occur in a year.

ISSIKI (S.), SONAN (J.) & TAKAHASHI (R.). **Studies on Bamboo Trypetids, I.** [*In Japanese.*]—*Bull. Dept. Agric. Res. Inst. Formosa*, no. 61, pp. 1–16. Taihoku, Formosa, July 1928.

Gastrozona macquarti, Hend., and *Acroceratitis plumosa*, Hend., are very common in Formosa and lay eggs in injured parts of young shoots of bamboo, which are used as a vegetable. They do not oviposit on the healthy bamboos in the field. The eggs hatch in 40 hours, and the adults appear in 19–23 days in spring. The flies cannot be found in the field in February.

Insects injurious to Sugar-cane in Formosa. [*In Japanese.*]—*Abstracts Works Sugar Expt. Sta. Formosa*, pp. 272–294. Taihoku, Dept. Agric. Govt. Res. Inst. Formosa, May 1928.

A list is given of 250 species of insects injurious to sugar-cane in Formosa, with brief notes on some of them. The most important include *Eucosma schistaceana*, Snell., *Scirpophaga auriflua*, Zell., *Chilo infuscatellus*, Snell., *Diatraea striatalis*, Snell., and *Sesamia inferens*, Wlk. Each of these moths has several generations a year.

Phanurus beneficiens, Zehnt., a parasite of *D. striatalis* and *C. infuscatellus*, was imported from Java in 1916 and killed 28·5 per cent. of the eggs in that year, and 26·4 in 1918. *Trichogramma australicum*, Gir., and *T. nanum*, Zehnt., parasitise the eggs of *D. striatalis*, *C. infuscatellus* and *E. schistaceana*, killing 40–60 per cent. or more.

The most injurious Lamellicorns are *Alissonotum impressicolle*, Arr., *A. crassum*, Arr., *A. pauper*, Burm., *Anomala expansa*, Bates, *A. dimidiata*, Hope, *A. cupripes*, Hope, and *Lachnosterna* (*Holotrichia*) *horishana*, Niij. & Kinosh., each of which has one generation a year. The chief larval parasite of these beetles is *Campsomeris* (*Dielis*) *annulata*, Smith. The principal injurious wireworms are *Melanotus* sp., *Septilus formosanus*, Schwartz, *Agonischius obscuripes*, Gyll., *Cardiophorus formosanus*, Mats., and *Agriotes formosanus*, Mats.

Oregma lanigera, Zehnt., is the most important Aphid, and has 14 or 15 generations a year, one female producing 60–120 young. *Encarsia flavoscutellum*, Zehnt., was imported from Java in 1926 to control it, and 170,000 individuals were liberated in the field, but the result has not yet been ascertained.

Other important cane pests in Formosa are the Gryllids, *Acheta bimaculata*, DeG., *Gryllus mitratus*, Licht., *Brachytrypes portentosus*, Licht., *Gryllotalpa africana*, P. de B., and other species of the genus, the termites, *Termes* (*Odontotermes*) *formosanus*, Shir., and *Capritermes nitobei*, Shir., and the army worms, *Cirphis unipuncta*, Haw., *C. loreyi*, Dup., *Spodoptera mauritia*, Boisd., and *Prodenia litura*, F.

Sonan (J.). **Studies on the Insect Pests of the Tea Plant. Part II.** [*In Japanese.*]—*Rep. Dept. Agric. Res. Inst. Formosa*, no. 29, 132 pp., 5 pls. Taihoku, October 1927.

The first paper of this series has already been noticed [*R.A.E.*, A, xiii, 225].

The Lymantriids, *Euproctis pseudoconspersa*, Strand, *E. sericea*, Wileman, *Porthesia taiwana*, Shir., *P. scintillans*, Wlk., *Pseudodura dasychiroides*, Strand, *Olene mendosa*, Hb., *Notolophus posticus*, Wlk., *Stilpnotia cygna*, Moore, and *Arctornis alba*, Bremer, infest tea in Formosa. *E. pseudoconspersa* and *N. posticus* are the most important. The former has 4 or 5 generations a year near Taihoku, all stages being seen throughout the year, although there are only 2 generations in Japan. The adults are nocturnal, the females living 4 or 5 days. As many as 31–193 eggs are laid, usually in a mass on the lower surface of the leaf, 2–5 days after mating. They are most common from December to May, and rare from July to September. The larvae hatch in 11–66 days and are most common from February to May. They are gregarious and feed on the leaves of tea, and sometimes on *Gordonia anomala* and *Cleyera ochracea*. After 32–62 days pupation occurs in the ground near the food-plants, among fallen leaves or, rarely, on the branches. The pupal stage lasts 6–25 days according to the temperature. The natural enemies recorded are the predacious Pentatomids, *Cantheconidea furcellata*, Wolff, and *C. formosana*, sp. n., a Carabid larva, and the parasites, *Tachina* sp., *Exorista* sp., *Apanteles lacteicolor*, Vier., and *Henicospilus pseudoconspersae*, sp. n.

N. posticus may have 8 or 9 generations a year, all stages being present at any season. The female, which does not fly, lays an average of 382·7 eggs on its empty cocoon soon after mating and then dies. The larvae, which hatch in 6–27 days, are most common from March to May, and rare from June to August, partly owing to their being killed by a parasitic fungus. They are gregarious in the younger stages and feed on 77 plants belonging to 30 distinct families, including tea, *Citrus*, *Albizzia*, *Acacia* and *Rosa*. The females moult 4 times and pupate in 17–61 days, and the males moult 3 or 4 times, pupating in 13–55 days. The pupae are found on the food-plants, and the pupal stage lasts 5–25 days in the case of the males and 4–18 in that of the females. One per cent. of the larvae are parasitised by *Tachina larvarum*, L., which also attacks a number of other Lepidoptera including *Olene mendosa* and *Pseudodura dasychiroides*. *Apanteles posticae*, sp. n., parasitises 6–10 per cent. of the larvae, and *Xanthopimpla punctata*, F., 2–3 per cent., the latter also attacking *O. mendosa* and *Sylepta derogata*, F. *Henicospilus striatus*, Cam., parasitises the larvae of *N. posticus*, *O. mendosa* and *P. dasychiroides*. Spraying with derris and soap, or nicotine sulphate and soap proved very effective, and collection of the gregarious larvae and pupae is also recommended.

MURAMATSU (S.). **Notes on the Life-histories and Habits of four Fruit Moths in Chosen. I.** [*In Japanese.*]—*J. Agric. Expt. Sta. Chosen*, no. 16, pp. 1–37, 5 pls. Suigen, Korea, November 1927.

The Pyralid, *Nephopteryx pirivorella*, Mats., which attacks pear, occurs all over Korea. There are two generations a year, the adults appearing in June and August and hibernation occurring in the larval stage. The females live 7–14 days and the males 5–8. Oviposition begins 3–6 days after emergence, the eggs of the first generation being laid near the calyces of the fruits, and those of the second on the apical parts of the branches or on the fruit buds. The larvae bore into the fruits, those from eggs laid on the buds first attacking the latter. In summer the larval stage lasts 7–12 days. A Tachinid parasitises the larvae, but is not an effective control.

The Tortricid, *Carposina sasakii*, Mats., occurs in the north of Korea. There are two generations a year, hibernation occurring in the larval stage in the soil. The adults appear from the end of May to the middle of June and again from the middle of August to the beginning of September. Oviposition begins 4–10 days after emergence, and the eggs are laid on the fruits of pear, peach, plum, apple, quince, etc. On an average 11 eggs are laid on one fruit, one female depositing 25–72. The larvae hatch in 7–9 days and bore into the fruits. Pupation occurs in the soil, the pupal stage lasting 7–10 days. Woolly wax is secreted from the infested fruits. A Hymenopterous parasite attacks the larvae.

Cydia (*Laspeyresia*) *molesta*, Busck, is very injurious to apple, pear, peach, plum, quince, etc. There are three or four generations a year, hibernation occurring as a mature larva. The eggs are laid on the lower surface of the leaves or on the fruits and hatch in 6–15 days. Pupation occurs in sheltered places on the food-plants, the adults emerging in 5–9 days. The eggs and larvae are parasitised by three species of Hymenoptera.

Eucosoma (*Tmetocera*) *ocellana*, Schiff., infests apple, pear, peach, plum, cherry and quince. There are two generations a year, hibernation occurring in the larval stage. The adults appear from the end of May to the beginning of June and again from the end of July to the middle of August. The females live 14 days and the males 5–9. About 4–9 eggs are laid singly on the midrib of a leaf 2 or 3 days after mating, and one female seems to lay more than 50 in the field. The larvae hatch in 6 or 7 days and feed on the leaves or sometimes externally on the fruit. Pupation occurs on the branches or buds, and the adults emerge in 6–9 days. The larvae are parasitised by two species of Hymenoptera.

Descriptions are given of all stages of these four moths.

Matsuda (M.). **Observations on** *Chrysopa vulgaris*, **Schn., var.** *anpingensis*, **Petersen.** [*In Japanese.*]—*Trans. Nat. Hist. Soc. Formosa*, xviii, no 95, pp. 97–114, 13 refs. Taihoku, Formosa, April 1928.

The lacewing, *Chrysopa vulgaris*, Schn., var. *anpingensis*, Petersen, is widely distributed in Formosa, where it attacks *Icerya purchasi*, Mask., *Pseudococcus filamentosus*, Ckll., *P. citri*, Risso, *Chrysomphalus aonidum*, L., and *Tachardina theae*, Gr. & Mann. One larva may destroy as many as 3,780 Coccids. In summer the eggs hatch in 3 days, the larval stage, including the prepupal period, lasts 11 days, and the pupal stage 4 days. The life-history and habits are described in detail.

El Lejah or Sooneh Insect.—*Transjord. Offic. Gaz.*, no. 133, pp. 7–9; typescript translation, 3 pp. [Amman, 1928.]

Eurygaster integriceps, Put., is reported from Transjordania as a pest of wheat and barley, sucking the sap of the grain. Wheat is the more severely damaged, since barley generally matures before this bug reaches its maximum and is protected by the glume covering it; a whole field may, however, be destroyed in a few hours if the grain is still in the milky state. *E. integriceps* emerges as an adult in March from exposed soil where the temperature rises quickly, and begins to feed immediately on the stalks just above the last joint; pairing occurs a few days after emergence, and eggs are laid on the upper parts of the blades of grass and wheat after about a month, hatching in about 10–12 days.

Wheat should not be sown in infested fields, and grass and weeds likely to harbour the pest should be destroyed. The collection of the bugs by bagging when emergence is first observed and again during the period of pairing and after harvest, as well as the use of heaps of grass placed along the sides of the harvested fields as traps, have been found to be the most effective means of control.

Thompson (W. R.). **A Contribution to the Study of Biological Control and Parasite Introduction in Continental Areas.**—*Parasitology*, xx, no. 1, pp. 90–112, 5 figs, 14 refs. Cambridge, April 1928.

The most striking successes with the method of biological control by the introduction of the parasitic and predacious enemies of foreign pests appear to have been obtained mainly in island areas. Objections to the use of this method in continental areas are based on the similarity between the fauna and flora of these areas, the polyphagous habits of many parasites, and the behaviour of hyperparasites. Studies on the natural control of indigenous species in such areas, however, show that control is effected by complexes of many factors differing both quantitatively and qualitatively in the different parts of the habitat, though these fluctuations have proved to be less important than they at first appear. In order to make this clear, the effect of the disappearance of controlling factors of the two main types (*i.e.*, those dependent on and those independent of the numerical value of the host population) is studied in detail, showing that the disappearance of an apparently unimportant factor from a system in equilibrium will permit of the increase and spread of the host. The effects that follow the introduction of foreign pests in continental areas constitute a clear demonstration of their escape from control, and the evidence indicates that the factor the absence of which has permitted increase and spread is the parasitic factor. Of the various ways in which equilibrium can be re-established, the biological method is the most promising for securing permanent and inexpensive control, though mechanical methods, which normally interfere little with the former process, must not be neglected. The author considers that the practical results obtained by parasite introduction in continental areas tend in general to support the theory he puts forward and justify the introduction of native parasites and predators of foreign pests even in the case of exchanges between continental areas.

Cleare, jr. (L. D.). **The Biological Control of Insect Pests.**—*Agric. J. Br. Guiana*, i, no. 1, pp. 26–33. Georgetown, March 1928.

This general account of the employment of natural enemies in the control of insect pests deals briefly with parasites of indigenous and imported insects, hyperparasitism, superparasitism and co-parasitism. Reference is made to some of the outstanding successes achieved in the biological control of insect pests, all of which refer to imported insects and their parasites.

[Kazanskiĭ (K. A.).] **Казанский (К. А.).** *Dendrolimus sibiricus*, **Tshtv., as a Forest Pest in the Buryat-Mongol Republic.** [*In Russian.*]—*Défense des Plantes*, iv, no. 6 (December 1927), pp. 861–915, 22 figs., 11 refs. Leningrad, 1928. (Also published separately with a Summary in English, price 1*r.* 20 *k.*)

An introduction to this paper, by N. Ya. Kuznetzov, includes a brief discussion of the systematic position of *Dendrolimus pini*, L., which occurs in European Russia and the Caucasus, *D. sibiricus*, Tshtv., distributed throughout southern Siberia, and *D. segregatus*, Butl., which is confined to Ussuri, their chief differentiating characters being briefly described and illustrated.

D. sibiricus, all stages of which are described, has been responsible for considerable injury to conifers in the Buryat-Mongol Republic (Siberia). During 1926 and 1927 extensive observations were made on its bionomics, the results of which are discussed in detail. The adult moths appear in July and lay their eggs on the needles of the trees, or sometimes on the branches and trunks. Oviposition occurs on spruce, fir [*Abies*], pine or even deciduous trees, though they may be unsuitable for the larvae. The first eggs were found in the open on 10th July, and oviposition continued for about three weeks. At temperatures of 18–21° C. [64·4–69·8° F.] the eggs hatched in 13–14 days, whereas under more natural conditions, with lower temperatures subject to greater variations, they hatched in 20–25 days. The newly emerged larvae wander in search of food; their method of feeding on the needles varies in different stages and is described. Very little feeding is done in September and October, though the larvae may remain in the crown of the tree until they are knocked down by wind and rain. Apparently a complete covering of snow is essential for hibernation, and this does not occur until October or November. The larvae emerge from their hibernating quarters under the moss during the first half of May and ascend to the crowns of the trees. In October and November they descend for the second winter and ascend again in the spring. The most usual food of the larvae is the needles of *Pinus cembra*, but *Abies sibirica*, *Picea excelsa*, *Larix sibirica* and *Pinus silvestris* are also readily attacked. After their second hibernation, the larvae feed voraciously for about a month and then pupate in cocoons about the beginning of June. Most of the cocoons occur in the top and periphery of the crown, but others may be found on any part of the stem, and even on deciduous trees in mixed stands or, in heavy infestations, on the ground. Under natural conditions pupation lasted 4 days, and the pupal stage 25–30.

The distribution of *D. sibiricus* in the area under review coincides with that of the forests containing a preponderance of conifers. Trees of all ages are equally attacked and may be completely defoliated. Though the older ones may produce new shoots and needles, these are usually demolished the following year and the tree succumbs. If the tree is not killed outright, it is predisposed to attack by secondary pests, a list of which is given, including particularly *Ips sexdentatus*, Boern., attacking *Pinus cembra* and *I. typographus*, L., attacking *Picea excelsa*. In addition to the direct damage done, the presence of *D. sibiricus* has also necessitated the abandonment of long standing sable preserves, as these animals do not remain in areas where the trees have died.

Though, according to Vasil'ev, a number of birds destroy both the larvae and the pupae, in the present investigations no birds were found in the infested areas. A few observations were made on parasites. *Telenomus* sp. attacked the eggs, and *Pimpla holmgreni*, Schmied., was reared from the pupae, the latter having previously been recorded as a parasite of *D. pini*. About 3–4 per cent. of the pupae were parasitised by a Tachinid, probably *Echinomyia* sp. The author considers that the only possible means of control would be dusting from aeroplanes. Experiments on a small scale with sodium arsenite gave very satisfactory results, as all the larvae died and the dust did not injure the trees.

[GAUZE (G. F.).] **Гаузе (Г. Ф.). The Variability of** *Locusta migratoria*, **L.** [*In Russian.*]—*Défense des Plantes*, iv, no. 6 (December 1927), pp. 915–929, 2 figs., 13 refs. Leningrad, 1928. Also in German in *Z. angew. Ent.*, xiii, no. 2, pp. 247–266, 9 figs. Berlin, December 1927.

Detailed biometrical studies were undertaken to test the theory of phases in *Locusta migratoria* advanced by Uvarov [*R.A.E.*, A, ix, 561]. From a consideration of the tables of measurements made by Uvarov, as well as the actual specimens that served Plotnikov for his criticism of this theory [xii, 226], the author's conclusions are in favour of the theory, while several inaccuracies in Plotnikov's observations and particularly in those by Makalovskaya [xiv, 57] are pointed out.

The paper is particularly important from the point of view of methods of studying variation in this locust.

[Rodionov (Z. S.).] **Родионов (З. С.). Pests of Cotton. Part II. Beetles, Aphids and Flies.** [*In Russian.*]—*Défense de Plantes*, iv, no. 6 (December 1927), pp. 933–951, 19 figs., 7 refs. Leningrad, 1928.

This paper on cotton pests in Transcaucasia is supplementary to one previously noticed [*R.A.E.*, A, xv, 474]. The insects dealt with are: the Elaterids, *Agriotes meticulosus*, Cand., *Heteroderes bicarinatus*, Reitt., and *Cardiophorus* sp.; the Curculionids, *Bothynoderes* (*Stephanophorus*) *strabus*, Gyll., *B. punctiventris*, Germ., *B. nubeculosus*, Gyll., *Tanymecus* (*Megamecus*) *variegatus*, Gebl., var. *robustus*, Fåhr., *Phacephorus* (?) *umbratus*, Fald., and *Otiorrhynchus fausti*, Stierl., which are most abundant in fields containing weeds; *Epicauta erythrocephala*, Pall.; the Tenebrionids, *Tentyria punctipleuris*, Reitt., and *Dasus pusillus*, F., both of which live in the top layer of the soil and may be controlled by poison baits; the Aphids, *Trifidaphis perniciosa*, Nevskiĭ, and *Aphis gossypii*, Glov.; *Phorbia* (*Hylemyia*) *cilicrura*, Rond., which caused considerable injury to cotton in 1926, the larvae feeding on the seed and cotyledons; and *Oecanthus turanicus*, Uv.

A general account is given of the reaction of cotton to the different pests in relation to varying ecological conditions. It is concluded that by a careful study of their biology and ecology suitable remedial measures might be ascertained and the crop increased by 30–40 per cent.

[Rodionov (Z. S.).] **Родионов (З. С.).** *Helophorus micans*, **Fald., as a Pest of Graminaceae in Irrigated Fields.** [*In Russian.*]—*Défense des Plantes*, iv, no. 6 (December 1927), pp. 951–954, 4 figs., 1 ref. Leningrad, 1928.

In Azerbaijan about 50 per cent. of the cultivated area is irrigated by flooding for several hours a few days before sowing. Although this serves to control a number of pests, it favours the development of others, such as the Hydrophilid, *Helophorus micans*, Fald., which breeds in stagnant water. The water left in the hollows and ditches after the fields are drained affords suitable breeding-places for this beetle. The eggs are laid in October and November in the cultivated layer of the field, which, after flooding, usually consists of liquid mud. The beetles burrow into the mud and remain there at a depth of about 2 inches. The adults and larvae are described. As the soil dries, the larvae descend to a depth of 4 inches or more. At first they attack the sprouts of the growing seeds of cereal crops, and later, when the shoots appear, they feed on the rolled leaves near the roots. As a result, the plants turn yellow and die. In plants that have already begun tillering, the larvae bore into the node and eat the shoots that are just forming. The development of the larvae continues from November to March, and the damage caused by them varied in different localities from 15 to 90 per cent. Pupation begins at the end of February and continues to the middle of April; the first adults appear at the beginning of April, emergence continuing throughout the month.

It is recommended that flooding of hollow areas be avoided, and that small puddles be made use of as trap areas and subsequently covered with kerosene or crude oil. At the beginning of April, when the majority of the beetles are in the pupal stage, the winter crops should be harrowed, as this will kill a number of the pupae and strengthen the tillering of the remaining healthy plants. Poison baits of bran and sodium arsenite broadcasted before sowing gave good results in the autumn of 1927.

[Rodionov (Z. S.).] **Родионов (З. С.). The Technique of preparing dry Powders for dusting Plants.** [*In Russian.*]—*Défense des Plantes*, iv, no. 6 (December 1927), pp. 983-986, 3 refs. Leningrad, 1928.

In various experiments undertaken in Russia with different carriers for sodium arsenite dusts, it has always been found that the value of the dust stands in direct relation to the amount of the active agent present, the neutral carrier having no effect whatever on the results. Such carriers only cause satisfactory distribution of the arsenical on the plants if their specific gravity is identical with that of the poison ; otherwise the materials tend to separate as the dust is applied. One of the great advantages of sprays over dusts is that the arsenicals are dissolved in water and are therefore evenly distributed ; this is also the case with poison baits where the bait is soaked in the poison solution. A small series of experiments were therefore undertaken in which various carriers, such as dust, chalk and tripoli earth, were soaked in a solution of sodium arsenite containing 53 per cent. As_2O_3 and then dried and dusted on the plants. To each 100 parts by weight of the neutral substance 1 to 3 of sodium arsenite were added. These dusts were tried against various insects, the best results being obtained with those containing chalk, particularly when used at the rate of 100 to 2 parts of the poison. This mixture also covered the leaves more evenly than the others. Very much better results were obtained with this method of preparation than when the same quantities were mixed in the dry state. Further experiments on a larger scale have been planned.

As the neutral substances used in these dusts are only accidentally eaten by the insects, it was thought that better results still might be obtained if they were replaced by some vegetable substance. In this connection ground peas were soaked in the poison solution (100–2) for 24 hours, by which time all the moisture was absorbed. They were then dried and powdered, thus combining a dust and bait. This mixture gave 100 per cent. mortality against grasshoppers.

[Stepantzev (I.).] **Степанцев (И.).** *Euxoa segetum*, **Schiff.** [*In Russian.*]—*Défense des Plantes*, iv, no. 6 (December 1927), pp. 989–992, 1 graph, 1 ref. Leningrad, 1928.

An account is given of the density of the larvae of the Noctuid [*Euxoa segetum*, Schiff.] in various parts of rye fields in the Government of Vologda, and the relation of the flight period to the time of pupation is discussed, the latter lasting on an average 44 days.

[Shiperovich (V. Ya.).] Shiperowitsch (V. J.) **The Distribution of the Tenthredinids injuring Pines in the Pargolovo Experimental Reserve, and the Factors checking their Increase.**—*Mitt. Leningrader Forstinst.*, xxxiv, 1927, pp. 104–118. (In Russian with a Summary in German.) (Abstract in *Centralbl. Bakt.*, (2) lxxv, no. 1–7, pp. 134–135. Jena, 2nd July 1928.)

On pines in the Ukraine some larvae of *Diprion* (*Lophyrus*) *sertifer*, Geoffr., were found in the colonies of *D.* (*L.*) *pallidus*, Klug, while *D.* (*L.*) *similis*, Htg., occurred in those of the former species. In the area under observation in 1922–25, 80·5 per cent. of the colonies were *D. sertifer*, 11·9 *D. pallidus*, 2·1 *D. similis*, and 5·5 *D.* (*L.*) *pini*, L.

In all these species, unfertilised eggs produced males only. *D. sertifer* and *D. pallidus* have one generation a year; the former hibernates in the egg-stage. Proctotrupid egg-parasites, and later Ichneumonids, Chalcids, and Tachinids limit the numbers of these sawflies, but the main factor is a disease due to *Bacillus septicaemiae lophyri* [*R.A.E.*, A, xiv, 209].

[Vasil'ev (I. V.).] **Васильев (И. В.). On the Biology of** ***Phylloxera*** **near Odessa.** [*In Russian.*]—*Vest. Vinodel. Ukrainui*, xxix, no. 4, pp. 199–204, 3 refs. Odessa, April 1928.

Work on the biology of *Phylloxera* near Odessa [*R.A.E.*, A, xv, 371] has been continued. An account is given of the seasonal history; both the root and leaf forms produce 5–6 generations a year. Hibernation probably always occurs in the larval stage, though in one instance a winged female from a gall collected in October laid two small eggs that produced males and one large one that produced a female that laid a winter egg.

The Tettigoniid, *Phaneroptera falcata*, Scop., in the adult stage destroys as many as 50 per cent. of the galls, but in the larval stage it causes considerable injury to the vines by feeding on the leaves.

[Vasil'ev (I. V.).] **Васильев (И. В.). On "Family Gall" of Leaf** *Phylloxera*. [*In Russian.*]—*Vest. Vinodel. Ukrainui*, xxix, no. 5, pp. 308–309, 4 refs. Odessa, May 1928.

The author discusses the occurrence of at least three generations of *Phylloxera* in single leaf-galls on American and hybrid vines in the Ukraine.

[Makarov-Kozhukhov (L. N.).] **Макаров-Кожухов (Л. Н.). The Vine Leaf-roller in Abrau-Dyurso in 1927.** [*In Russian.*]—*Vest. Vinodel. Ukrainui*, xxix, no. 5, pp. 287–290. Odessa, May 1928.

Notes are given on the seasonal history of the vine-moth, *Polychrosis* (*Eudemis*) *botrana*, Schiff., in Abrau-Dyurso (northern Caucasus) as observed in 1927. There are apparently three generations a year, hibernation probably occurring in the larval stage or possibly as pupae. Larvae were found in stored grapes that had been gathered in September. Paris green either alone or in combination with Bordeaux mixture gave satisfactory results against the larvae. The infestation was also successfully controlled in some areas by crushing the larvae in the leaves.

Ten Years of Work (1918-1927). Collection of Papers on the Work of the Scientific Departments of the Saratov Regional Agricultural Experiment Station. [*In Russian.*]—278 pp., pls. Saratov, 1928.

Most of the insect pests discussed in the report of the Entomological Department by N. L. Sakharov (pp. 195–231) have already been noticed from other sources [*R.A.E.*, A, xiii, 473; xiv, 28; xvi, 151]. Others are *Colaphus hoëfti*, Fald., *Entomoscelis adonidis*, Pall., and a number of species of *Phyllotreta*, all attacking mustard; and *Chaetocnema breviuscula*, Fald., a pest of beet. A detailed study of this flea-beetle was undertaken in 1927. As soon as the young shoots of the beets appear in the spring, the adults migrate to them and feed on the first leaves and the top buds. Eggs are laid during May in the soil near the roots of the plants. They hatch in about 12 days, and the larval stage lasts about a month, pupation beginning in the middle of June and continuing to the end of July. The larvae feed on the young roots, which become bent owing to the depressions produced, but this does not cause any serious damage to the plants. The adults emerge at the beginning of July and feed on the leaves, but do not cause much injury. They lay the majority of their eggs at the end of July, and the larvae hatch in August, pupating at the end of the month. When the beets are harvested, the flea-beetles migrate to weeds and presumably hibernate as adults.

A few experiments were made with various insecticides, of which arsenical and tobacco dusts gave the best results.

BRĀMANIS (L.). **Examples of Injury by *Myelophilus* and its Importance in Connection with the Barking of Stumps.** [*In Lettish.*]—*Abh. Forstw. Lettland. forstw. Ver.*, reprint 20 pp., 3 figs. Riga, 1928. (With a Summary in German.)

The distribution of *Myelophilus* in the forests of Latvia is greatly assisted by the forestry methods practised. The felled and unhealthy trees and unbarked stumps are allowed to form centres of infestation. Saw-mills and stacked wood in the vicinity of the forest are also a source of danger. The usual remedial measure adopted is to bark the stumps. In order to ascertain the importance of these stumps in the development of *M. piniperda*, L., observations were made during May-June 1927, in a pine clearing. It was found that stumps with a diameter of 12 inches and about 10 inches high contained an average of 14–16 brood galleries; the average number of eggs in a brood gallery was 30–35. Though barking would be of some use in controlling the beetles, its actual value would be very limited in these extensive forests. It was also found that 40–45 per cent. of these galleries were on the side of the stumps that had the greatest distance (10–14 inches) between the soil surface and the cut surface, whereas on the short side (3–8 inches) only 10 per cent. of the brood occurred ; the stumps were on a slope. In view of the relation between the number of galleries and the height of the stumps, it would appear advisable to cut the stumps as low as possible instead of barking them, and this would also be much cheaper.

BRĀMANIS (L.). **Further Investigations on *Hylobius abietis*, L.** [*In Lettish.*]—*Rep. Latvian Inst. Plant Prot. 1926-27*, pp. 4–8. Riga, 1927.

Investigations were made to ascertain the extent of damage caused by *Hylobius abietis*, L. [*cf. R.A.E.*, A, xv, 207] to pines of different ages and to determine the number of larvae in a single trunk. In 27 different localities, covering an area of about 260 acres, 6·4 per cent. of the two-year-old pines were infested, 48 per cent. of those 3–4 years old and 63·7 per cent. of those 5–10 years old. The infestation in spruce trees 3–6 years old was higher and averaged 85·2 per cent. A single stump examined which was 1 ft. high and 1½ ft. in diameter, contained 270 larvae, most of which were in the roots of 2–4 inches in diameter and at a depth of 6 inches.

Ozols (E.). **Observations on the Influence of Arsenicals on Cultivated Plants and some Pests.** [*In Lettish.*]—*Rep. Latvian Inst. Plant Prot. 1926-27*, pp. 8–13. Riga, 1927.

Experiments have been conducted to determine the effect of lead, copper and sodium arsenates on cultivated plants at various periods of their development. A list of the plants is given in order of their resistance. Experiments with copper arsenate against *Phaedon cochleariae*, F., were conducted on a larger scale. A spray of 0·1 per cent. copper arsenate and 0·5 per cent. soap, produced a death rate of 70 per cent. by the seventh day; by increasing the copper arsenate to 0·3 per cent. a mortality of 100 per cent. was obtained in the same time. The treatment did not affect the plants. Lead arsenate applied against *Strophosomus capitatus*, DeG. (*obesus*, Marsh) at concentrations of 1, 3 and 5 per cent. produced 100 per cent. mortality in 13, 8 and 2 days respectively.

Ozols (E.). & Zirnits (J.). **Insect Pests in 1926.** [*In Lettish.*]—*Rep. Latvian Inst. Plant Prot. 1926-27*, pp. 13–16. Riga, 1927.

Aphids were very abundant in 1926, the most noticeable being *Aphis* (*Siphonaphis*) *padi*, L., and *Macrosiphum granarium*, Kirby, on cereals; *M. pisi*, Kalt., on leguminous plants; *Aphis pomi*, DeG., on apples; *Hyalopterus arundinis*, F. (*pruni*, F.), on plums; and *Phorodon humuli*, Schr., on hops. *Phaedon cochleariae*, F., destroyed practically the entire crop of cruciferous plants in certain localities. Since 1921–22 the Aleurodid, *Trioza viridula*, Zett., has been gradually increasing in numbers on carrots, and a heavy infestation may be expected in 1928. *Gortyna ochracea*, Hb., occurred in small numbers on tomatos, and in one case *Lygus pabulinus*, L., completely destroyed the crop of strawberries.

Horn (W.) & Schenkling (S.). **Index Litteraturae Entomologicae. Serie I. Die Welt-Literatur über die gesamte Entomologie bis inklusive 1863.** Bd. I, Aalborg-Ferrière, pp. 1–352, 1 pl.; Bd. II, Ferrill-Le Conte, pp. 353–704, 1 pl. Berlin-Dahlem, Dr. W. Horn. Price *Mk.* 18·75 per volume.

Series I of this index is a revised and enlarged edition of Hagen's *Bibliotheca Entomologica*, including 25,000 titles instead of 17,000, and dealing with the world literature of Entomology up to the end of 1863; it will be completed by the issue of two more volumes.

Schwerdtfeger (F.). **Untersuchungen über die Entwicklung des weiblichen Geschlechtsorgans von *Melolontha melolontha* L. während der Schwärmzeit.** [Investigations on the Development of the female Genitalia of *M. melolontha* during Flight-period.]—*Z. angew. Ent.*, xiii, no. 2, pp. 267–300, 6 figs., 27 refs. Berlin, December 1927.

The first section of this paper deals with the morphology of the undeveloped female genitalia in *Melolontha melolontha*, L., prior to the flight-period, and the second with the subsequent changes. As a measurement of the degree of maturity, the volume of the lowest egg in an egg-tube might be taken, calculated according to formula $4/3\pi\ ab^2$, in which a is half the long axis, and b, half the short axis in millimetres. For comparing one egg with another, however, it is only necessary to take the product of the variable figures ab^2, which is termed the "egg-factor." The immature egg (the lowest egg in the egg-tube of a beetle still in the ground) has an average factor of 0·21, while the average factor for a mature (newly laid) egg is 2·09. Egg maturity is conditioned by pairing, feeding before and after pairing, and sufficient warmth. The genitalia do not develop unless food has been taken after pairing, and low temperatures hinder feeding. At the first oviposition 12–30 eggs are laid ; a repetition of oviposition was not obtained experimentally, the eggs being laid in 14–18 days after pairing. Examination of non-captive individuals, however, makes it highly probable that a second oviposition occurs, for the curve of the average size of the egg-factors shows two distinct peaks separated by an interval of fifteen days. During the flight-period the weight of the male beetle varies continually, whereas that of the female shows two definite peaks corresponding to the egg-factor. The number of the eggs undergoing development remains constant during the period of egg-maturation, whereas that of the eggs that have not begun development is constantly increased by supplies from the ovaries. As the number of eggs undergoing development is larger than the accession of immature eggs, the total number of eggs decreases with each deposition. By designating each oviposition by a Roman numeral (I, II, III) and the degree of maturity of the eggs by the Arabic numerals, 0, $\frac{1}{4}$, $\frac{1}{2}$, $\frac{3}{4}$, and 1, it is easy to indicate the condition of a beetle ; thus II $\frac{1}{2}$ would indicate a beetle containing half-mature eggs after the first oviposition.

Jancke [*R.A.E.*, A, xv, 675] concluded that *Melolontha* usually only oviposits once, but this is probably due to his having begun his observations on 29th May, whereas the author began on 3rd May and the first peak of his curve had already been passed by the 29th.

KALANDADZE (L.). **Ueber die Biologie des Museumskäfers** *Anthrenus verbasci* **L. und seine Bekämpfung.** [The Biology and Control of the Museum Beetle, *A. verbasci*.]—*Z. angew. Ent.*, xiii, no. 2, pp. 301–311, 6 figs., 6 refs. Berlin, December 1927.

The name museum beetle is applied to two species, *Anthrenus museorum*, L., and *A. verbasci*, L., which are often confused and of which the latter is the more injurious. The adults of *A. verbasci*, which do not seem to feed, appear in March and April, there being one generation a year in Germany under conditions of room temperature and normal feeding. The eggs are laid singly a week after pairing ; 36 eggs develop in the 12 egg-tubes, but they are not all deposited. The first larvae hatch at the end of May or early in June and immediately begin to feed. Pupation in the larval skin occurs in February, the pupal stage lasting 3–4 weeks. Infestation may be prevented by the use of naphthalene or of specimen boxes with closely fitted lids. The beetles and larvae may be destroyed by fumigation with carbon bisulphide or hydrocyanic acid gas, and as the eggs cannot withstand moisture, steam or water may be used in instances where they will not be harmful to specimens or specimen boxes.

MÜLLER (K.). **Beiträge zur Kenntnis des Kornkäfers** *Calandra granaria* **L.** [Contributions to the Knowledge of the Grain Weevil, *C. granaria.*]—*Z. angew. Ent.*, xiii, no. 2, pp. 313–374, 24 figs., 164 refs. Berlin, December 1927.

Notes are given on the systematic position and distribution of *Calandra granaria*, L., with detailed descriptions of the morphology and anatomy of the adult and larva, the egg and pupa being dealt with briefly. The main part of the paper treats of the biology of this weevil.

C. granaria occasionally occurs in the field, but it reproduces indoors only, normal reproduction taking place in grain in sacks. The eggs are laid 17–20 days after pairing, provided that the temperature is over 12° C. [53·6° F.] and there is sufficient food. In heaps of grain they are laid at a depth where warmth and moisture are assured ; large grains are preferred to small ones. While two or three larvae (of varying ages and therefore probably the progeny of different females) may be found in one grain, only one develops to the adult stage. It would appear that from 55 to 75 eggs are laid by a female, and oviposition can occupy as much as four months or more, so that three generations can be reproducing at the same time. Oviposition did not occur at a temperature below 9° C. [48·2° F.]. The egg stage lasted up to 14 days in September and October, and 8 days in May and June. The larva in its early stages can only live within the grain in which the egg was laid. If the larva pierces the grain envelope and comes out, it dies unless suitable débris (flour, etc.) is available, in which case it continues development if over 14 days old. The larval stage lasts about 40 days, but may be prolonged to 75 in cool weather in late summer or in autumn. Contrary to statements in the literature, the larva may pupate without having consumed the entire contents of a grain. Pupae removed from the grains yielded normal adults.

Adults that had been frozen in water for two days recovered after slow thawing. In the open, a temperature of $-7°$ C. [19·4° F.] can be withstood for two days, and in grain stores the weevil must be able to survive very cold winters. At a room temperature of 15° C [59° F.] it can survive submersion for 10 days in water. Feeding experiments under equal conditions, especially as regards moisture, showed that it prefers maize, wheat, rye and barley to oats, but moist oats are preferred to dry wheat. It cannot apparently breed in leguminous seeds. Edible chestnuts are readily attacked provided that cracks in the shell permit entry.

BARNES (H. F.). **A new Gall Midge** (*Mayetiola phalaris* **sp. n.**) **reared from** *Phalaris arundinacea.*—*Z. angew. Ent.*, xiii, no. 2, pp. 375–377, 1 fig. Berlin, December 1927.

Mayetiola phalaris, sp. n., which closely resembles *M. destructor*, Say, is described from specimens bred in Germany from *Phalaris arundinacea.*

ALLERS (—). **Vom diesjährigen Auftreten des Fichtennestwicklers** (*Tortrix tedella*) **im Harz.** [Notes from this Year's Occurrence of the Spruce Tortrix (*T. tedella*) in the Hartz Mountains.]—*Forstarchiv*, 1927, no. 2, pp. 22–23. (Abstract in *Z. angew. Ent.*, xiii, no. 2, p. 394. Berlin, December 1927.)

In 1925 *Epiblema* (*Tortrix*) *tedella*, Cl., fed on spruce right into the winter, and during the summer of 1926 adults were numerous. In spite of this the caterpillars later on in the year were not very injurious, and this is attributed to the chief feeding period having occurred at a much later date than in the preceding year.

KRIEG (H.). **Die Bekämpfung des Eichenwicklers in den Oberförstereien Bischofswald und Haste.** [Work against the Oak Tortrix in Upper Forest Divisions of Bischofswald and Haste.]—*Forstarchiv*, 1926, no. 18, pp. 273–276.

LORGE (—). **Bekämpfung des Eichenwicklers** (*Tortrix viridana*) **durch Bestäubung vom Flugzeug aus in der Preussischen Oberförsterei Haste.** [Work against the Oak Tortrix, *T. viridana*, by dusting from an Aeroplane in the Prussian Upper Forestry Division of Haste.]—*Z. Forst- u. Jagdwesen*, 1927, no. 3, pp. 168–178. (Abstracts in *Z. angew. Ent.*, xiii, no. 2, pp. 397–398 & p. 399. Berlin, December 1927.)

In 1926 the method of dusting from an aeroplane was used against *Tortrix viridana*, L., for the first time in Germany, in an area of about 1,360 acres at Bischofswald and Haste, Prussia [*R.A.E.*, A, xv, 124]. In favourable weather 10,370 lb. of calcium arsenate was dusted in one and a half days on about 926 acres.

The second paper states that the cost of dusting was about twenty-four shillings an acre. While the effect upon the caterpillars was highly satisfactory, some animals and birds were killed, and bees were destroyed in large numbers.

REISSIG (—). **Beobachtungen und Erfahrungen bei der Spannerbekämpfung mittels Flugzeugs im Jahre 1926.** [Observations and Experiences in Work against the Pine Moth by Means of Aeroplanes in 1926.]—*Forstwiss. Centralbl.*, 1927, no. 3, pp. 81–89.

REISSIG (—). **Ein Beitrag zur Flugzeugbekämpfung von Forstschädlingen.** [A Contribution to Work by Aeroplane against Forest Pests.]—*Deutsche Forstwirt*, 1927, no. 34, pp. 193–194.

KOLSTER (—). **Bekämpfung des Kiefernspanners in der Oberförsterei Hersfeld-Ost von Flugzeug aus.** [Work against the Pine Moth in the Upper Forestry Division of Hersfeld-Ost by Means of Aeroplanes.]—*Z. Forst- u. Jagdwesen*, 1927, no. 4, pp. 237–251. (Abstracts in *Z. angew. Ent.*, xiii, no. 2, pp. 398–399. Berlin, December 1927.)

As a result of aeroplane dusting against the pine moth [*Bupalus piniarius*] in the Palatinate in 1926 [*R.A.E.*, A, xv, 508], Dr. Wolff's suggestion that small airships should be used instead of aeroplanes is supported, because the air driven by the aeroplane prevents a uniform deposit of the insecticide.

In the second paper it is pointed out that the hilly nature of the Palatinate makes slow flight necessary for the proper distribution of the dust; alternatively the technique of dusting must be improved. Arsenic is of little value against the larvae of the pine moth [*cf.* xv, 674].

The third paper deals with work done at Hersfeld-Ost, where dusting with calcium arsenate cost about £1 an acre, and was fairly satisfactory, but deer, hares, birds and bees were killed.

Wülker (G.). **Zur Kenntnis der Stachelbeerblattwespen.** [A Contribution to the Knowledge of the Gooseberry Sawflies.]—*Z. angew. Ent.*, xiii, no. 3, pp. 419–450, 14 figs., 49 refs. Berlin, March 1928.

In 1923 and 1924 an outbreak of *Pteronus* (*Pteronidea*) *ribesii*, Scop., occurred throughout Germany. The economic loss was small owing to the low value of the crop and the capacity of gooseberry bushes to recover from defoliation. The smaller gooseberry sawfly, *Pristiphora pallipes*, Lep., also occurred in one locality.

In Central and Southern Germany *P. ribesii* can have four or possibly five generations a year; further north there are only two or three. The complete life-cycle requires about 30–40 days.

In 1927, in July, the egg stage lasted 5–7 days at an average temperature of 17·5° C. [63·5° F.], and the larval stage 18 days at 18·3 C. [65° F.]; 10–12 days were spent in the cocoon at the end of May 1924 at an average temperature of 19° C. [66·2° F.]. The few observations on the development of *Pristiphora pallipes* indicate that it is similar to that of *Pteronus ribesii*. The latter deposits rows of eggs partly embedded in narrow slits in the leaf-ribs on the lower surfaces. *P. pallipes* splits the edges of the leaves to form pockets, each of which completely encloses an egg. Parthenogenetic oviposition in *P. ribesii* produced males only. Details on moulting, feeding, excretion, respiration, spinning, and colour of cocoon of these species are given, as well as descriptions of the male and female genitalia of *P. ribesii*. Three Tachinid flies and twenty-six Hymenoptera, a list of which is given, parasitise these sawflies, but do not seem materially to affect their numbers.

Kleine (R.). **Prüfung neuer chemischer Mittel zur Bekämpfung des Kornkäfers,** *Calandra granaria* **L.** [Tests of new Chemicals for combating the Grain Weevil.]—*Z. angew. Ent.*, xiii, no. 3, pp. 451–465. Berlin, March 1928.

A detailed account is given of experiments with six proprietary fumigants, none of which proved likely to be really effective against *Calandra granaria*, L., under practical conditions. The germinating power of rye was seriously diminished, though barley and oats were less affected.

Handschin (E.). **Untersuchungen über die Widerstandsfähigkeiten von Tapeten gegenüber Insektenfrass.** [Investigations on the Capacities of Wallpapers to resist Feeding by Insects.]—*Z. angew. Ent.*, xiii, no. 3, pp. 466–476, 2 figs., 4 refs. Berlin, March 1928.

A series of experiments, recorded in detail, made with six species of cockroach, showed that wallpapers printed in certain oil-colours, when pasted on walls, may be considered to be proof against them, because oil-colour prevents the wetting of the paper base, and softening with saliva is necessary before the Blattids can scrape off the pigments.

Bodenheimer (F. S.). **Ist** *Lixus algirus* **L. ein Schädling?** [Is *L. algirus* a Pest?]—*Z. angew. Ent.*, xiii, no. 3, pp. 477–482, 4 figs., 2 refs. Berlin, March 1928.

Broad beans (*Vicia faba*) only yield a moderate crop in Palestine, especially in dry years, and as infestation by *Lixus algirus* L., is very marked in these years, this weevil has been thought to be responsible. A description of all stages is given. Adults were taken in March, April and May, and a few in August. The March generation gives rise to the adults in April and May, but it is uncertain whether the August adults are stragglers or represent a further generation. In spring, development takes about two months. Examination of the infested stems showed that the yield from them was slightly superior to that from uninfested ones, so that *L. algirus* is apparently not injurious.

Vietinghoff-Riesch (A. Frhr. von). **Das Verhalten paläarktischer Vögel gegenüber den wichtigeren forstschädlichen Insekten (v–ix).** [The Behaviour of Palaearctic Birds towards the more important Insect Pests of Forests (v–ix).]—*Z. angew. Ent.*, xiii, no. 3, pp. 483–512, 21 refs. Berlin, March 1928.

This paper is one of a series of studies [*R.A.E.*, A, xii, 574 ; xiii, 480] and deals with the relation of birds to Elaterids, *Luperus pinicola*, Duft. (pine-leaf beetle), *Camponotus* spp., and *Tortrix viridana*, L.

Tänzer (E.). **Die Probleme des deutschen Seidenbaues.** [The Problems of Silk Production in Germany.]—*Z. angew. Ent.*, xiii, no. 3, pp. 513–548, 239 refs. Berlin, March 1928.

In the course of this discussion a brief review is given of the natural enemies of *Bombyx mori* and of the insects attacking mulberry in various parts of the world, including notes on the biological control of *Aulacaspis pentagona*. Mention is also made of the various wild species of silkworms.

Eidmann (H.). **Eizahl und Eireifung einiger forstlich wichtiger Schmetterlinge. Vorläufige Mitteilung.** [The Number and Maturation of Eggs of some Lepidoptera of Importance to Forestry. Preliminary Communication.]—*Z. angew. Ent.*, xiii, no. 3, pp. 549–554, 4 figs. Berlin, March 1928.

In this preliminary account of investigations not yet complete, a description of the female genitalia in Lepidoptera is given. In the pine-moth, *Panolis flammea*, Panz., only one-fifth of the average number of 580 eggs are ready for deposition in newly-emerged individuals. The condition of the ovaries and eggs at various times is described in detail in the case of this species. In *Bupalus piniarius*, L., a newly emerged female contains about 300 eggs, and the maximum number of eggs laid is about 180. The number of eggs in the ovaries cannot by itself be taken as an indication of the amount of oviposition [*cf. R.A.E.*, A, xvi, 373].

Escherich (K.). *Otiorrhynchus scaber* **L.** (=*septentrionis* **Hbst.**) **als Tannenschädling.** [*O. scaber* as a Pest of Silver Firs.]—*Z. angew Ent.*, xiii, no. 3, pp. 554–557, 5 figs., 1 ref. Berlin, March 1928.

After citing the few references to *Otiorrhynchus scaber*, L., in the literature of forest entomology, an account is given of injury done by this weevil in October 1927 to four-year-old silver firs [*Abies*] growing among spruce in Upper Bavaria. The young trees were either partly or totally defoliated, and the bark had been removed in many places on the stems and branches. The needles lay on the ground and were only partly eaten. Only a few weevils were found; they were on the ground near the trees, but their responsibility for the injury was confirmed experimentally. The weevils observed were probably young ones that had begun feeding in order to mature, such feeding being no doubt continued after hibernation.

Ruszkowski (J. W.). **Z badań nad muchami zbożowemi w Poznaniu w latach 1921-1927.** [Observations on the Grain Flies in Posen during 1921–1927.]—*Rocz. Nauk rol. leś.*, xix, reprint 8 pp. Posen, 1928. (With a Summary in German.)

An account is given of field and laboratory observations on *Oscinella* (*Oscinis*) *frit*, L., *Chlorops taeniopus*, Mg., *Meromyza saltatrix*, L., *Hylemyia coarctata*, Fall., *Opomyza florum*, F., and *Mayetiola destructor*, Say. Tables are given showing the number of flies caught by sweeping in 1926 and the degree of infestation by the different species in different years in relation to the time of sowing of winter grain.

Kozikowski (A.). **Opaślik sosnowiec** (*Barbitistes constrictus*, **Br.**) **jako nowy szkodnik sosny.** [*B. constrictus* as a new Pest of Pines.]—*Polsk. Pismo ent.*, vi, pt. 1–2, pp. 33–48, 6 figs., 11 refs. Lemberg, 1927. (With a Summary in German.)

In Poland the Tettigoniid, *Barbitistes constrictus*, Br., has hitherto been regarded as a mountain species, but it has now been found in the pine forests lower down. In some localities 50 per cent. of young needles were destroyed, and the bark of young shoots was also attacked, this latter injury resembling that of *Hylobius abietis*, L. *B. constrictus* is nocturnal in habits. The larva appears early in May and the adult at the end of June and early in July, oviposition occurring in August. A generation may perhaps require two years, but this requires confirmation. It has been suggested that *B. constrictus* may be a factor in the control of the nun moth [*Lymantria monacha*, L.], but this is not considered possible, as the latter's eggs are laid in cracks of the bark where *B. constrictus* cannot reach them. Moreover, the Tettigoniid usually occurs in the mountains, where the moth is not found, and in the lowlands, where it was observed, its occurrence and that of the moth were at quite different times. As a preventive measure against *B. constrictus*, a dense canopy of the crowns should be maintained, because it prefers sun and warmth.

Mokrzecki (Z.). **Report of the Institute of Forest Protection and Entomology, Skierniewice-Poland, 1924-1927.** [*In Polish.*]—*Polsk. Pismo ent.*, vi (1927), pt. 3–4, pp. 265-325, 7 figs., numerous refs. Lemberg, 1928. (With a Summary in English.)

An account is given of the work conducted during the years 1924–1927, much of which has already been noticed. Among the chief forest pests are *Melolontha melolontha*, L., and *M. hippocastani*, F., the larvae of which are described. *Panolis flammea*, Schiff. (*griseovariegata*, Goeze) [*R.A.E.*, A, xii, 106] was controlled during 1924 by the fungus, *Empusa aulicae.* Other natural enemies are the egg-parasite, *Trichogramma evanescens*, Westw., var. *piniperdae*, Wolff., and *Dirhicnus* (*Pteromalus*) *alboannulatus*, Ratz., which infests the pupae. Over 56 per cent. of the larvae of *Diprion* (*Lophyrus*) *pallidus*, Klug, were infected by the fungus, *Botrytis tenella.* Infection probably occurs during feeding, but the larvae are not killed until the cocoon is completed. *Microplectron fuscipennis*, Zett., a Chalcid parasite of this sawfly, was also particularly abundant.

STRAŇÁK (F.). **Hromadný výskyt rýžkoholeníka lžičníkového** (*Entomoscelis adonidis* **Pall.) na kulturách řepky v Bulharsku.** [An Outbreak of *E. adonidis* on Rape in Bulgaria.]—*Ochrana Rostlin*, viii, pt. 2–3, pp. 33–48, 12 figs. Prague, 1928. (With a Summary in German.)

Observations on an outbreak of the Chrysomelid, *Entomoscelis adonidis*, Pall., during the spring of 1927 in Bulgaria are described. The following is taken from the author's summary :—The eggs are laid in October just below the surface of the soil in any place that will provide sufficient food, warmth and dryness for the larvae. About 80–120 eggs are laid by each female. Though hibernation usually occurs in the egg stage, a few larvae may hatch, if the autumn is very warm, and hibernate in the soil. As a rule the larvae hatch in March and feed for about three weeks. The food-plants include various species of *Brassica, Adonis vernalis*, etc. The pupal stage lasts ten days. The adults feed on the flowers and young carpels of rape. Remedial measures include collecting the larvae and the use of sprays of arsenicals or oil.

AYOUTANTIS (A.). **Greece : Introduction and Acclimatization of** *Novius cardinalis.*—*Internat. Rev. Agric.*, xix, no. 3, pp. 317–318. Rome, March 1928.

The projected importation of *Novius cardinalis*, Muls., against the scale, *Icerya purchasi*, Mask. [*R.A.E.*, A, xv, 316] has been carried out, and this Coccinellid is now established in two centres near Athens.

Italy : Damage done by *Sminthurus viridis* **to Wheat.**—*Internat. Rev. Agric.*, xix, no. 3, p. 318. Rome, March 1928.

Smynthurus viridis, L., is reported for the first time on wheat in Italy, where towards the end of November 1927 it was discovered near Pisa, gnawing the leaves of very young wheat plants and checking their growth over an area of 12–15 acres. The attack was controlled by spraying with tobacco extract, though the Collembola were still present in an adjoining field of lucerne, where obvious damage had been caused.

YOSSIFOVITCH (M.). **Kingdom of the Serbs, Croats and Slovenes : Official Control of the Trade in Insecticides and Fungicides.**—*Internat. Rev. Agric.*, xix, no. 3, p. 319. Rome, March 1928.

Official control of insecticides and fungicides in Jugoslavia has been established. A proprietary product may not be sold unless provided with an authorisation by the Ministry of Agriculture, to whom its composition must be disclosed. Any substance that does not correspond with its declared composition is confiscated.

FEYTAUD (J.). **Les chenilles du prunier. La chenille verte** (*Cheimatobia brumata*, **L.**).—*Rev. Zool. agric.*, xxvii, no. 1, pp. 1–5, 2 figs. Bordeaux, January 1928.

The foliage of plum trees in the south-west of France is severely damaged by the larvae of the winter moth, *Cheimatobia brumata*, L., in March, April and May, and cherries, apples, apricots and pears are also attacked. The larvae are not affected by frost and attack the buds when the protecting sheaths are opening. After feeding for about a month, they descend to the ground and pupate at a depth of about 4 or 5 inches. The method of infestation of an orchard is almost always by means of the introduction of new trees harbouring eggs. The Ichneumonid, *Sagaritis zonata*, Grav., and a Braconid, *Meteorus pallidus*, Nees, limit the numbers of *C. brumata* to some extent. Frequent cultivation of the soil, combined with rolling and, if possible, the use of poultry, does much to reduce the numbers of pupae, and sticky bands should be placed round the trees in October and left until February. Arsenical or nicotine sprays are useful when infestation is established on the trees. Other pests, frequently occurring with *C. brumata*, are *Hybernia defoliaria*, L., and *Anisopteryx aescularia*, Schiff. [*R.A.E.*, A, xii, 455].

LHOSTE (L.). **Note sur la faune entomologique des graines.**—*Misc. ent.*, xxx, no. 12, pp. 94–95, 1 ref. Castanet-Tolosan, December 1927.

A list is given of Coleoptera that have, during recent years, been taken alive in seeds received in Paris for sale from various parts of the world. None of them appears to have become acclimatised in France, nor does it seem likely that they could breed to any extent in stored seed, as the seeds in question are imported in small quantities and rapidly distributed. Instances are given of other insects, including several Bruchids and *Calandra* spp., that breed freely in stores and cause much damage.

PERROT (E.). **L'état actuel de la question du chrysanthème (pyrèthre) insecticide.**—*C. R. Acad. Agric. Fr.*, xiv, no. 14–15, pp. 539–553, 14 refs. Paris, 1928.

The characteristics of the pyrethrines obtained from pyrethrum are briefly discussed and their toxic action on insects is explained. The possibilities of growing pyrethrum on a large scale in France are considered [*R.A.E.*, A, xvi, 288]. The cultivation of the plant is particularly recommended on calcareous soils that are unsuitable for the growing of other crops. Pyrethrine is considered to be a most powerful agent for controlling insect pests, and fresh uses for it are constantly being discovered ; it is a potent specific against the intestinal parasites of man and may eventually be found to replace other imported drugs in this respect.

MILES (H. W.). **Azalea Culture in Belgium.**—*J. Minist. Agric.*, xxxv, no. 2, pp. 137–147, 4 pls., 5 refs. London, May 1928.

This paper includes a brief account of the insects attacking azaleas in Belgium, the most important of which is *Gracilaria azaleella*, Brants (azalea leaf miner), the larvae of which appear in July and August and cause considerable leaf injury to the plants while out of doors. Larvae and pupae are taken indoors with the plants in the autumn, and there continue their development [*cf.* *R.A.E.*, A, xv, 118]. *Heliothrips haemorrhoidalis*, Bch., appears on the plants when the conditions are dry, or in winter on plants placed near hot water pipes, and it is most injurious in poorly ventilated houses. Dipping in winter after pruning in a mixture of soap, flowers of sulphur, chalk and nicotine, with water as a diluent, is recommended as a general preventive measure, and grafts may be dipped in nicotine soap wash or in a suspension of pyrethrum before use. Azaleas are also attacked by the larvae of a Noctuid moth, which cause injury to the young shoots in early spring, and those of a Tortricid, possibly *Oxygrapha* (*Acalla*) *schalleriana*, L., which spin the young leaves about the buds and cause much damage by feeding within the shelter thus formed. Hand picking the larvae is advocated in both cases, in addition to spraying with lead arsenate against the Tortricid. *Trialeurodes vaporariorum*, Westw., occurs in the houses in spring, chiefly attacking varieties of azaleas with hairy leaves.

WARBURTON (C.). **Annual Report for 1927 of the Zoologist.**—*J. Roy. Agric. Soc. England*, lxxxviii, pp. 320–326. London, 1927.

This is a review of the insect pests observed in England in 1927, only the popular names being given in most cases. As a whole the year is characterised as being uneventful as regards insects. *Hylobius abietis*, L., which is one of the most important forest pests in Britain, is recorded as attacking Douglas fir [*Pseudotsuga taxifolia*].

CHOPARD (L.). **Les recherches récentes sur les acridiens migrateurs.**—*Rev. Hist. nat. appl.*, (1) ix, no. 5, pp. 141–149, 10 refs. Paris, May 1928.

This is a brief summary of recent works on the bionomics of locusts.

BONDAR (G.). **Uma nova broca das avores fructiferas** (*Tropidosoma spencei* **Kirb.**). [A new Borer of Fruit Trees, *T. spencei*.]—*Chacaras e Quintaes*, xxxvii, no. 4, pp. 356–357, 2 figs. S. Paulo, 15th April 1928.

The larvae of *Tropidosoma spencei*, Kby., a Cerambycid common in Brazilian forests, have been noticed in the State of S. Paulo boring in an imported plum tree. They bore in living wood down the branches into the trunk, where they enlarge the mine to form a pupal chamber. Brief descriptions are given of the larva and adult. The remedy advised is the injection of 1 cc. of carbon bisulphide into the lowest of the openings made along the mine in order to expel the débris, the aperture being then sealed.

PICKEL (B.). **Alguns parasitos radicicolas de cafeeiro, em Pernambuco.** [Some Pests of the Roots of Coffee in Pernambuco.]—*Chacaras e Quintaes*, xxxvii, no. 4, pp. 369–370. S. Paulo, 15th April 1928.

In the State of Pernambuco the only pest attacking the coffee bush above ground is *Leucoptera coffeella*, Guér., the larvae of which appear to be very abundant during the rainy weather in winter, but do not occur in summer from September to January. Pests of the roots are numerous and include termites and the Coccids, *Rhizoecus coffeae*, Laing, which is fostered by ants (*Acropyga pickeli*, Borgm., and *Pheidole* sp.), *Pseudococcus citri*, Risso, *P. cryptus*, Hempel, and *Geococcus radicum*, Green. *P. cryptus* lives in symbiotic relation with a fungus, supplying it with honey-dew and receiving from it protection against dryness. All these pests can be destroyed by watering the roots of the bushes with a 3 per mille solution of sodium cyanide at the rate of 2 gallons to a bush, the application being made when the ground is well soaked.

DA CUNHA BUENO (A.). **Combate ás vaquinhas da videira.** [Work against the Vine Beetles.]—*Chacaras e Quintaes*, xxxvii, no. 4, pp. 392–393, 1 fig. S. Paulo, 15th April 1928.

Colaspis trivialis, Boh., and *Haltica* (*Altica*) *ampelophaga*, Guér., which attack the leaves of the grape-vine in the State of Paraná, may be collected by shaking them on to a cloth spread on the ground. Additional measures against *H. ampelophaga* include the use of shelter-traps, allowing fowls to run in the vineyard, and the application of contact insecticides, such as a nicotine spray, or dusts of tobacco and sulphur, or sulphur and lime.

PETCH (C. E.). **Experiments in the Control of the Round-headed Apple Tree Borer** (*Saperda candida* **Fab.**) **with Calcium Cyanide.**—*Sci. Agric.*, viii, no. 9, pp. 560–566, 4 figs. Ottawa, Ont., May 1928.

Saperda candida, F. (round-headed apple tree borer) is a very serious pest of apple trees in Quebec ; in one orchard it was responsible for the death of 528 trees and for severe injury to 111, in a block of 900 trees. The eggs are laid in incisions in the outer bark of the trunks, one individual depositing between 15 and 30 ; the larvae bore into the inner bark, making shallow, flat burrows, where they hibernate. They resume feeding in May, the solid wood almost exclusively being attacked, and in young trees they penetrate to the centre. They hibernate in the burrow again during the following winter, working their way toward the surface when nearly mature. Pupation takes place about ½ in. from the surface, the larvae blocking the burrow with sawdust in front and behind ; the adults mature in the pupal chamber and emerge during June and July through circular holes cut in the bark and do slight damage by feeding on the twigs and the stems and midribs of the leaves. The presence of *S. candida* is shown by retarded growth and the yellowing of leaves in the latter part of the season, but is usually not apparent in newly infested trees until the second year, when cracked, sunken patches of bark may be found near the base of the tree, while reddish castings are forced out through the holes. Young trees may be completely severed from the ground by the borers, and although injury to larger trees is not always fatal, their growth and fruit are greatly retarded. The larvae usually work in the base of the trunk, often below the surface of the soil, and in large roots, though occasionally the upper parts of the trunk may be attacked.

Experiments conducted during 1926–27 show that calcium cyanide kills the larvae without damaging the trees. The calcium cyanide was applied in a teaspoon and thrown against the trunk of the tree above the castings, and then covered with a trowelful of earth, the latter apparently being essential for satisfactory results. This proved the best method of application against the older larvae, but against young larvae in the bark the best results were obtained when the calcium cyanide was mixed to the consistency of a thick paint with castor oil and smeared over the area indicated by the castings. Calcium cyanide kills the young larvae 2 to 1½ times as quickly as they are killed by digging them out, while older larvae are killed 9 times as quickly ; it becomes active about 6 hours after application, the activity ceasing after about 24 hours. Potassium cyanide used instead of calcium cyanide killed the trees. Attempts to suffocate young borers by applications of shellac gave negative results.

SWAINE (J. M.). **Progress in Forest Insect Control in Canada.**—*Pulp & Paper Mag. of Canada,* 1928, pp. 500–502. Montreal, 1928.

Tortrix (*Cacoecia*) *fumiferana,* Clem. (spruce budworm) has been responsible for the destruction of about 150 million cords of pulpwood in parts of Quebec and in the Maritime Provinces, and continues to cause damage in Central Ontario, Cape Breton Island and Northern Nova Scotia, while recent outbreaks have occurred in Western Ontario and Northern Manitoba. The greatest damage has been done in and around the mature stands containing the largest percentage of balsam [*Abies balsamea*] and red spruce [*Picea rubra*], while white spruce [*P. canadensis*] and black spruce [*P. mariana*] were not extensively attacked in Quebec or New Brunswick; the former, however, is apparently being seriously affected in the present Ontario outbreak. In view of this fact, it is recommended that over-mature balsam stands should be felled as quickly as possible, and that in the future the older stands should be systematically cut first, in order to produce a fast-growing stand of balsam and spruce, cut on short rotation, in which it seems probable that no extensive outbreak of *T. fumiferana* would develop. Tests have been made with the distribution of poison dusts by aeroplanes over the infested forest, but these were not at first entirely successful, since in many cases *T. fumiferana* bores into the buds before they are fully opened, and as these open at different periods in the different trees, the larvae are protected to some extent ; eventually, however, the dust was applied in different doses to most of the selected plots with a fair degree of exactness, but owing to the lateness of the season, the work had to be discontinued before the largest plots could be treated.

Dendroctonus monticolae, Hopk. (mountain pine beetle) and *D. brevicomis,* Lec. (western pine beetle), which have severely damaged forests of yellow pine [*Pinus ponderosa*] in British Columbia during the past 6 years, now appear to be under complete control, more than 50,000 infested trees having been cut down and burned ; and it is thought that the development of further outbreaks can be prevented by the burning of logging slash and careful annual inspections and the adoption of occasional measures on a small scale. *D. monticolae* also attacks lodgepole pine [*Pinus contorta*], and the infestation spreads with such rapidity that unless control measures are undertaken at the outset of the outbreak there is very little chance of success.

Lygaeonematus erichsoni, Htg. (larch sawfly), which caused severe damage over a generation ago from the Atlantic to the Great Lakes, killing the greater part of the larch forests, is again becoming dangerous and has also spread westwards to northern British Columbia. Owing to the characteristics of sawfly infestation, the most effective means of control appears to be the use of parasites. An introduced parasite [*Mesoleius tenthredinis*, Morl.] has recently been found in large numbers in one locality in Manitoba [*R.A.E.*, A, xvi, 450]; parasitised cocoons have been sent to Ontario, and the parasites bred and liberated.

Fox (J. H.). **The Life History of** *Exeristes roborator*, **Fab., a Parasite of the European Corn Borer.**—*Rep. Nat. Res. Council*, no. 21, 58 pp., 14 pls. Ottawa, 1927.

A laboratory study has been made of the life-history of *Pimpla* (*Exeristes*) *roborator*, F., a parasite of *Pyrausta nubilalis*, Hb. (European corn borer), with the object of discovering data of value in its commercial rearing and colonisation and to estimate the probability of its successsful establishment in the maize-growing areas of Canada. All stages of the parasite are described, and an account is given of the methods of experiment, the apparatus used, and the manner in which the parasites were reared.

The incubation period was found to vary considerably with the temperature, and the eggs hatched best when the relative humidity was high, there being a marked increase in mortality when it was lower than 40 per cent.; under favourable conditions, the usual period for incubation is 24 hours. On hatching, the larva immediately begins to feed on the body of the host, puncturing the skin and sucking the body juices. The length of the larval feeding period varied considerably, even at constant temperatures. At a constant temperature of 86° F., it lasted 4–25 days with an average of 6·8 for males and 7·5 for females. With the temperature ranging from 52 to 69° F., it lasted 31–41 days. The average length of the whole larval stage of the female was 12·3 days and of the male 10·6 days; in both sexes the pupal stage lasted 4–10 days. Pairing generally occurs on the second day after emergence, females occasionally, however, mating on the first day, but never readily after the fifth day; oviposition takes place in from 5 to 10 days, females continuing to lay until a few days before death. Eggs laid by unmated females develop exclusively into males. Adults were fed upon sugar, water and corn-borers, large numbers of the latter being killed for food alone; honeydew is thought to take the place of sugar under natural conditions. Experiments indicate that oviposition does not take place on a diet of sugar and water only. It was also found that *Papaipema nitela*, Gn., cannot serve as an alternative host for this parasite. All adults exposed to winter temperature for more than a short time died; the parasite passed the winter, usually, in the cocoon in the last larval instar, but sometimes in the pupal stage, and can endure a minimum temperature of –8° F. In addition to hibernation, another type of dormancy was found to occur; this appears to be produced by a sudden drop in temperature, experienced by the fifth instar larva after spinning, and its duration seems largely independent of the subsequent temperatures, whereas hibernation is brought on by low temperatures and lasts only for the duration of these temperatures.

P. roborator develops over a wide temperature range; it may be expected to appear fairly early in the spring and is present until late in the autumn. Adults are capable of emerging from a depth of at least 3 ins. in the soil.

Robinson (W.). **Relation of Hydrophilic Colloids to Winter Hardiness of Insects.**—*Colloid Symposium Monograph*, v, pp. 199–218, 9 figs., 23 refs. New York, Chemical Catalog Co. [1928.]

The following is the author's summary of this paper: Some previous evidence is given for the existence of bound water in a hydrophilic colloid system, and for adsorption of water being directly proportionate to winter hardiness of plants. The present series of experiments was conducted to determine if the phenomenon of adsorption of water under low temperatures observed by Newton for wheat plants would hold for insects. The heat-of-fusion method of Thoenes for separating free and bound water was used, and a detailed description of the method and its application is given. The insects used comprised a hardy, a neutral and a non-hardy species (*Callosamia promethea*, Dru., *Lachnosterna* (*Phyllophaga*) sp. and *Calandra* (*Sitophilus*) *granaria*, L.); and it was found as the experiments progressed that the different species gained or lost in bound water in direct proportion to their winter hardiness. The biological significance and the advantages to the species of having the free water transformed into the bound form on the approach of winter is discussed.

Dudley, jr. (J. E.), U.S. Bur. Ent., & Fluke, jr. (C. L.). **Spraying versus Dusting to control the Potato Leafhopper in Commercial Potato Fields of Wisconsin.**—*Res. Bull. Wisc. Agric. Expt. Sta.*, no. 82, 16 pp., 6 figs., 7 refs. Madison, Wisc., February 1928.

A detailed account is given of experiments carried out during the years 1922–25 against *Empoasca fabae*, Harr. (potato leafhopper) in Wisconsin, where it regularly causes serious damage to potatoes, by means of spraying with Bordeaux mixture (4–5–50) and dusting with copper-lime dust containing either 20 or 25 per cent. monohydrated copper sulphate, according to whether or not an arsenical was included for the control of the Colorado potato beetle [*Leptinotarsa decemlineata*, Say]. It was found that the yields from dusted and sprayed plants were equal within limits of experimental error, and although the cost of dusting was a little more than that of spraying, it is usually preferred on account of its greater speed and adaptability. The average increase in the yield for dusting and spraying combined varied from 22·7 bushels to the acre in two years of little injury to 59·3 bushels to the acre in years of severe injury, as compared with the treated plots. The cost of 4 applications to the acre was estimated at £2 16*s*. for spraying and £3 for dusting.

Fulton (B. B.). **The Apple Curculio and its Control by Hogs.**—*J. Agric. Res.*, xxxvi, no. 3, pp. 249–261, 5 figs., 8 refs. Washington, D.C., 1st February 1928.

Damage to apples by *Tachypterellus* (*Tachypterus*) *quadrigibbus*, Say (apple curculio) may be locally severe, though the weevil does not feed on many of the common varieties of apple. The injury caused may be distinguished from that done by *Conotrachelus nenuphar*, Hbst. (plum curculio) by the greater depth of the cavities formed, this being especially apparent in young fruit while the injury is recent; in mature apples the feeding cavities made by *T. quadrigibbus* are not closed over by the growth of the apple, the portion of the skin undermined drying out and enlarging the opening. The egg punctures of *C. nenuphar* are characterised by a crescent-shaped cut along one side.

T. quadrigibbus has only one generation a year. The egg-laying period lasts about a month, most of the eggs being deposited before the June drop is completed. Normally the apple must drop for the larva to complete its development, the entire larval and pupal stages being spent within the fruit; there is, however, no evidence to indicate that infestation by *T. quadrigibbus* causes dropping. Counts were made of the number of fallen and picked apples infested, and it is thought that about 80 per cent. of the new brood will be found on the ground by 15th July, the adults beginning to emerge about 1st July; these feed mainly on the fruit, but also attack leaves and the cambium of green spurs.

Experiments made with arsenical sprays were unsuccessful, and as the weevils crawl away or take to flight very rapidly when disturbed, a tree-jarring method of control is impracticable. From experiments made to test the resistance of the larvae and pupae to heat, it would seem improbable that they could live long if apples were removed from under the trees and exposed to direct sunlight. Adults were able to emerge from apples buried under 6 ins. of soil, and as this protects the immature stages from direct sunlight, disking is not advisable. The best results in the control of *T. quadrigibbus* have, however, been obtained by confining pigs in the orchard during the early summer; no cultivation should be done after the apples begin to drop, and 5 pigs to the acre will clean up the early dropped apples and will not feed on the trees to any extent if the apples grow more than 1 ft. above the ground. Pigs should not be oiled while they are in the orchard on account of possible injury to trees from oil rubbed into the bark.

McDonald (R. E.). **Division of Entomology.**—*20th Rep. Commiss. Agric.* [*Texas*] *1926–27*, pp. 27–30. Austin, Tex., 1927.

The average damage done by the pink bollworm [*Platyedra gossypiella*, Saund.] in Texas is not extensive, although individual fields sometimes show an infestation of about 25 per cent. It has been found that the sterilisation of seed, when supplemented by very cold winters, is a perfect control measure, but that the bollworm can survive a winter in the field where the temperature does not fall below 15–20° F., and in stored seed cotton or cotton seed in almost any climate.

In view of the fact that in March 1927 *Anastrepha ludens*, Lw. (Mexican fruit-fly) was found to be present in the lower Rio Grande Valley, where *Citrus* is grown extensively but very little other fruit is produced on a commercial scale, it was decided to endeavour to exterminate the pest by starvation. It is proposed that all ripe and ripening fruit should be removed by 1st March and the trees kept free until about 1st October, when oranges and grapefruit ripen naturally. The plan has been in operation since May, and State and Federal quarantine orders regulating the movement of fruit have been promulgated.

The growing of sweet potatoes has been abandoned over large areas of the State owing to infestation by the sweet potato weevil [*Cylas formicarius*, L.], and regulations have been put into force to prevent its further spread.

THIEROLF (W. R.). **The economic Importance of** *Paratenodera sinensis* **(Orthop. : Mantidae).**—*Ent. News*, xxxix, nos. 4 & 5, pp. 112–116, 140–145, 4 refs. Philadelphia, Pa., April & May 1928.

Paratenodera sinensis, Sauss., a praying mantis that has been comparatively recently introduced into the United States from China, is rapidly gaining a foothold in the vicinity of Philadelphia. In addition to normal annual spread, successful efforts have been made to colonise it in fresh localities, but in view of the fact that its economic status has not yet been established upon a scientific basis, the author considers that additional investigations should be instituted before further extending its distribution. He briefly discusses previous investigations on *P. sinensis* and *Stagomantis carolina*, L., a closely related species, and gives the results of laboratory and field observations on the feeding habits of the former carried out in the spring of 1926, together with a microscopic analysis of the contents of the alimentary tracts. These observations show conclusively that while large numbers of these Mantids attack bees and beneficial Ichneumonids, they also destroy Lepidoptera and their larvae, grasshoppers and sawflies. Other types of insects consumed represent both beneficial and harmful classes, the latter preponderating numerically. These observations are on too small a scale to afford a basis for the classification of Mantids as definitely harmful or beneficial.

TOWNSEND (C. H. T.). *Schistocercophaga*, **new Genus of Locust Parasites (Larvaevoridae) (Dipt., Tachinidae).**—*Ent. News*, xxxix, no. 5, p. 152. Philadelphia, Pa., May 1928.

Schistocercophaga, gen. n., is erected for *Oedematocera dampfi*, Aldrich, a parasite of *Schistocerca paranensis*, F., in tropical America.

HIESTAND (W. A.). **A new Type of Moth Trap.**—*Ent. News*, xxxix, no. 5, pp. 158–160, 2 figs. Philadelphia, Pa., May 1928.

The author, collaborating with C. H. Hicks in 1923, designed a new and successful type of moth trap consisting of a spoutless funnel 10 ins. in diameter, the small end of which is soldered into a circular hole cut in the screw cap of a Mason jar. This is hung by 3 or 4 wire rods with bent ends hooked into the funnel and the other ends similarly hooked into a galvanised iron disk, also 10 ins. in diameter, to which is bolted a porcelain socket to receive an electric light bulb. The distance between the disk and the funnel depends on the size of the bulb used, the tip of the bulb projecting about 1½ ins. below the rim of the funnel. An eyelet should be soldered on to the top of the disk for hanging the trap, which may be fastened to poles outside windows. Powdered potassium cyanide placed in a cheesecloth bag in the jar was used to kill the insects, the numbers caught on warm nights being sufficient to necessitate the use of a jar of 2 U.S. qts. capacity. Powdered cyanide, which gave better results than lump cyanide, is more effective if moistened with a few drops of tartaric or citric acid on the first time of using, and may be kept from deteriorating by unscrewing the funnel when not in use and replacing it by an ordinary screw cap.

HAYES (W P.) & MCCOLLOCH (J. W.). **Ecological Studies of Kansas Scarabaeid Larvae (Coleop.).**—*J. Econ. Ent.*, xxi, no. 2, pp. 249–260. Geneva, N.Y., April 1928.

The following is mainly taken from the authors' summary: A study of the collections of 18,781 Lamellicorn larvae over a period of eight years, in addition to 359 parasitised grubs, indicates a rearing mortality of 68·7 per cent. Of the 31·3 per cent. reared, 964 belonged to the genus *Lachnosterna* (*Phyllophaga*) and the remaining 4,920 individuals belonged to 20 species of various genera. The seasonal distribution of the various species is shown, as well as their relative abundance. The habitat preferences of all species are indicated, and a preference is shown, in several instances, for unploughed soil, which is contrary to the older accepted statements that hard, packed soil is chosen. Most of the larvae of *Lachnosterna* were taken from blue-grass sod, maize and then wheat being next in order of preference. *Ochrosidia immaculata* is taken far more abundantly on wheat than elsewhere, though it is fairly numerous on maize and oats; the adults show a preference for land that is frequently ploughed. *Ligyrus gibbosus* and *Anomala binotata* prefer oats and then wheat, while only small numbers were found on maize. *A. kansana* occurs most frequently on wheat, while *Cotalpa lanigera* occurs in wheat and maize, usually in the sand hill area. The data on the grubs parasitised by *Tiphia* spp. indicate that these parasites are more abundant in ploughed soils than in sod land.

GRANOVSKY (A. A.). **Alfalfa "Yellow Top" and Leafhoppers.**—*J. Econ. Ent.*, xxi, no. 2, pp. 261–266. Geneva, N.Y., April 1928.

This is an account of the observations and experiments carried out during 1926–27 that proved conclusively that *Empoasca fabae*, Harr., is responsible for the injury to lucerne known as "yellows" or "yellow top" [*cf. R.A.E.*, A, xv, 282]. "Yellow top" is considered of great economic importance, since infested fields do not, as a rule, yield more than one third of a normal crop of hay. Hairy Peruvian lucerne is usually considered immune, but several tests showed that while it is not preferred by leafhoppers in the open fields, both it and other varieties are subject to identical symptoms when leafhoppers in cages are concentrated on them. The root system of infested plants was found to be considerably weakened, and this is considered an important factor contributing to the death of lucerne in winter. The nature of the disease is not known, but the symptoms indicate the presence of some infective principle or virulent toxin introduced into the tissue of the plants with the salivary secretion of the insect in the process of feeding.

BIGGER (J. H.). **Hibernation Studies of *Colaspis brunnea* (Fab.).**—*J. Econ. Ent.*, xxi, no. 2, pp. 268–273. Geneva, N.Y., April 1928.

During 1924–26 *Eucolaspis* (*Colaspis*) *brunnea*, F., became a serious pest of maize in the central part of Illinois. In 1926 at least 2,000 acres of maize were totally destroyed, and many more were damaged by the feeding of the larvae on the roots of the seedlings. The damage occurred mainly after clover was ploughed under and maize planted as the succeeding crop, particularly on land ploughed in the late spring. Studies on the hibernation of *E. brunnea* are here described and show that it passes the winter in the larval stage, the majority of the larvae going below the line of heaviest frost in the fields. In red clover the largest numbers were found 8–10 inches below the surface and in sweet clover 6–8 inches. The largest number of larvae was always found in the soil around the roots of second year red clover, a few in first year red clover and sweet clover and very few in fields of soy-beans and timothy.

HINDS (W. E.) & SPENCER (H.). **Utilization** of *Trichogramma minutum* **for Control of the Sugarcane Borer.**—*J. Econ. Ent.*, xxi, no. 2, pp. 273–278, 1 pl. Geneva, N.Y., April 1928.

Since September 1925 eggs of *Diatraea saccharalis*, F., have been collected and examined in order to determine the efficiency of the parasite, *Trichogramma minutum*, Riley, and the indications are that in Louisiana the parasites are few in number each spring, increase slowly until late July and then become very numerous and very effective in reducing the numbers of *D. saccharalis*. The great variation in the percentages of parasitism in different fields led to the belief that *T. minutum* spreads very slowly in spring, possibly on account of its delicate nature and poor flying ability. It was therefore hoped that its artificial colonisation in fields from which it was absent during the spring might establish it earlier than would naturally be the case. Accordingly in June and July 1927, a small scale experiment was made ; parasites were recovered from the colonised field two weeks after the first introduction and throughout the season the rate of parasitism was considerably higher than in the control field. In September the parasitism had reached 97·7 per cent. More extensive experiments were planned for 1928, and the technique and equipment for rearing a sufficient number of parasites are described. The eggs used for rearing purposes are those of *Sitotroga cerealella*, Ol. (Angoumois grain moth).

KING (K. M.). *Barathra configurata*, **Wlk., an Armyworm with Important Potentialities on the Northern Prairies.**—*J. Econ. Ent.*, xxi, no. 2, pp. 279–293, 1 pl., 2 figs., 12 refs. Geneva, N.Y., April 1928.

In 1927 there was an outbreak of *Barathra configurata*, Wlk. (bertha armyworm) in the Prairie Provinces of Western Canada. The larvae attack nearly every dicotyledonous plant growing in flower and vegetable gardens and in cultivated fields, members of the families Chenopodiaceae and Cruciferae being more or less favoured food-plants, while flax, sweet clover and lucerne are severely injured. The more mature larvae feed on the ripening seed pods if these are available, but flowers and leaves are also readily eaten. Records of injury to various crops are given, and it is pointed out that some weeds, particularly *Chenopodium album*, are so suitable for oviposition and so heavily attacked as to be very important sources of infestation to crops. Partial descriptions of the larvae and pupae are given, primarily for purposes of differentiation. The moths from the overwintering pupae emerge in early June and are sometimes present until August, the maximum abundance in an average year in the northern prairies being reached in late June or early July. They appear to be entirely nocturnal and feed freely at flowers of various kinds, particularly those of wild mustards. The moths are only occasionally attracted to light and then only when a fairly bright light is very close to them. After a rather short pre-oviposition period, large numbers of eggs are laid in flat patches upon vegetation. The larvae hatch in a few days and in the earlier instars are solitary and mostly nocturnal, except when feeding in entirely concealed situations. The habits of the older larvae become more variable. Most of the larvae attacking marigolds, peas, etc., hide during the day among rubbish or vegetation on the surface of the soil, or even burrow slightly into the earth. Most of those feeding on cabbage or maize, or boring into the pods of peas or beans, remain on the plants during the day, while older larvae on flax, sweet clover, etc., usually remain on the heads throughout the 24 hours, although fully exposed to bright hot sunshine or cold beating rains. The larvae usually reach maturity in the early part of September and pass the winter as pupae in the soil.

The most generally important natural factor in the control of this insect is the high mortality in the pupal stage. In nearly all outbreaks the numbers have been greatly reduced by the activities of flocks of crows. During a heavy infestation in 1925, under conditions of high humidity and high temperatures, the larvae were killed by a disease, the maximum mortality being 40–50 per cent. The importance of egg-parasites has not yet been determined, but the rate of parasitism of the larvae is low, the highest recorded being 25 per cent. in an infestation in its second year. An Ichneumonid (? *Paniscus* sp.) caused the greater part of the parasitism, a Tachinid being the only other parasite found. An account is given of the characters by which various other larvae that have been confused with *B. configurata* may be distinguished.

The distribution of this moth and the history of its outbreaks are briefly discussed. It seems to be definitely associated with the drier or grass-land areas, though it is also found within the edge of the savannah. The information obtained indicates that it is gradually increasing as an agricultural pest, and in the present area of heavy infestation the damage to sweet clover is important owing to the increasing value of this crop.

Ploughing, particularly in the autumn, to destroy the pupae is valuable as a control measure and should also be applied to infested patches of *Chenopodium album.* Arsenical dusts and bran baits have been found effective under some conditions. The outstanding feature of the known outbreaks of *B. configurata* is the irregularity of their occurrence, which, while lessening the immediate importance of the pest, makes it much more difficult to undertake adequate measures for its control.

King (K. M.). **Economic Importance of Wireworms and False Wireworms in Saskatchewan.**—*J. Econ. Ent.*, xxi, no. 2, pp. 294–295. Geneva, N.Y., April 1928.

This paper, of which only a summary is published, is a preliminary report (based on more than five years' work) on the present situation in regard to damage by wireworms and false wireworms (*Eleodes*) in Saskatchewan. Heavy infestations occur generally throughout the western two-thirds of the Province and in occasional fields in the eastern districts. In 1926 the losses were estimated at about £700,000, and this figure is believed to be near the mean annual loss in recent years. In 1927 the net loss on one heavily infested field of 200 acres was about £800, 80 acres of wheat being completely ruined. In another field the yield in 1925 was reduced to about 50 per cent., but the damage was so evenly distributed that the extent of the losses was scarcely suspected by the farmer. These instances are more or less typical of conditions in many fields each year. The most severe damage by wireworms almost invariably occurs to the first crop following a summer fallow year in an infested field, and on the whole the heavier infestations are associated with fields that have been continuously cultivated in small grain rotations that do not include grass. It is therefore anticipated that the damage will increase in importance, as a large acreage of virgin forest is coming under cultivation each year, and this is substantiated in fact by the yearly discovery of new fields and districts in which damage by wireworms has become of economic importance.

More than a dozen species of wireworm have been found in the fields investigated. *Corymbites* (*Ludius*) *aeripennis tinctus*, Lec. (prairie grain wireworm) is the most important ; although frequently abundant in native sod of some types and in seeded pastures, it occurs independently of grass. *Hypnoidus* (*Cryptohypnus*) *nocturnus*, Esch., which is next in importance, is typically associated with sod land. Other species important in one or more of the fields examined were *Limonius pectoralis*, Lec., *Corymbites* (*Ludius*) *virens*, Schr., *Drasterius* (*Aeolus*) *dorsalis*, Say, and two undetermined species of Agriotini. Larvae of *Corymbites* (*L.*) *limoniiformis*, Horn, *Hypnoidus dubius*, Horn, and an undetermined species resembling *C.* (*L.*) *resplendens*, Esch., are found in small numbers in cultivated fields. False wireworms are of relatively minor importance as yet, and the five species recorded in Saskatchewan occur only in the more arid part of the Province. *Eleodes extricata convexicollis*, Blais., was important in a few fields, while *E. tricostata*, Say, did slight damage in gardens. Adults of *E. hispilabris*, Say, were frequently observed, but this species has not been authentically recorded as injuring crops.

SMITH (F. F.), FISHER (H. J.) & GUYTON (T. L.). **Hot Water Immersion for Boxwood Leaf Miner Control.**—*J. Econ. Ent.*, xxi, no. 2, pp. 295–301, 1 fig. Geneva, N.Y., April 1928.

In an attempt to find a practical method of control for *Monarthropalpus buxi*, Lab. (boxwood leaf-miner) under nursery conditions, experiments were carried out during 1927 to test the effectiveness of treatment by immersion in hot water. From preliminary tests in spring, it was concluded that developing buds and tender new growth were injured, at temperatures fatal to the larvae, but by mid-summer the treated plants had completely concealed the injury by new growths from adventitious buds. In late June, infested potted plants from out of doors immersed in water at 120° F. for from five to ten minutes were uninjured, and the young larvae and eggs were killed. The method used in the later experiments for immersing the plants is described, and the results are given in a table. Satisfactory control was obtained on *Buxus sempervirens* at 120° F. with an exposure of 10 minutes during July and August, 7 minutes in early September, and 5 minutes in the last half of September and October. Other temperatures may be substituted provided that the times of exposure are correspondingly altered as indicated in a table. Bleaching of the foliage by the sun usually follows treatment to a certain extent, but may largely be prevented by shading the south and west sides of the plants. *Lepidosaphes ulmi*, L., and *Lecanium corni*, Bch., were observed on some of the plants, but immersion at 120° F. for five minutes killed all that were examined.

GRAHAM (S. A.). **The Influence of Small Mammals and other Factors upon the Larch Sawfly Survival.**—*J. Econ. Ent.*, xxi, no. 2, pp. 301–310. Geneva, N.Y., April 1928.

During the past 20 years *Lygaeonematus erichsoni*, Htg. (larch sawfly) reached epidemic proportions in the swamp forest in the Lake States, defoliating and killing enormous numbers of larches. The young trees that survived this outbreak are growing and reproducing well, but unless practical control measures can be developed, it is almost certain that another outbreak will occur and cause a much greater economic loss, owing to the increased value of larch timber. An account is given of experiments undertaken to determine the effect of certain environmental factors in reducing the number of sawfly cocoons. The results show that 30–76 per cent. of the cocoons hibernate successfully buried in the sphagnum moss in the swamps, while on high ground conditions were less favourable. This would seem to indicate that larches on well drained soil where there is no moss might not be severely injured by the sawfly. The natural enemies that reduce the numbers of cocoons include insect parasites, entomophagous fungi and small mammals, of which the latter are the most important. Parasitic insects and fungi kill less than 10 per cent. of the prepupae, whereas mice and shrews destroy on the average 50–80 per cent. Mice appear to be more important than shrews in this respect. In the swamps where there is a great variety of woody and herbaceous plants, mouse food is abundant, mice are numerous and the destruction of sawfly cocoons is consequently great. On the other hand mice are comparatively scarce where the ground is covered with moss and sedges.

HOUSER (J. S.). **The European Red Mite,** *Paratetranychus pilosus*.—*J. Econ. Ent.*, xxi, no. 2, pp. 311–312. Geneva, N.Y., April 1928.

Observations made early in the season on fruit trees to which dormant sprays had been applied showed that *Paratetranychus pilosus*, C. & F. (European red mite) was abundant in the control plots and those sprayed with lime-sulphur, while it was absent or very scarce in plots sprayed with oil. By early autumn, however, the situation had been reversed, and the plots sprayed with lime-sulphur were practically free from overwintering eggs, while those sprayed with oil were heavily infested. In one orchard in Ohio where this had occurred, the Coccinellid, *Stethorus punctum*, Lec., was found in large numbers feeding on both eggs and mites wherever they were most plentiful, and it seems probable that this predator was attracted to the infestations on the trees sprayed with lime-sulphur, but had not spread so rapidly as the mite, which was therefore able to deposit large numbers of overwintering eggs on the previously uninfested trees that had been sprayed with oil. Since biological control is, however, uncertain and the oil sprays are so effective, the author recommends oil spraying in spring when eggs of *P. pilosus* are abundant.

SANDERS (J. G.). **Observations on European Red Mite** (*Paratetranychus pilosus* (**C. & F.**).—*J. Econ. Ent.*, xxi, no. 2, pp. 313–314. Geneva, N.Y., April 1928.

Paratetranychus pilosus, C. & F. (European red mite) attacks the foliage of fruit-trees in the east of the United States and Canada, and considerable injury with consequent heavy loss of fruit has occurred in several regions. Observations indicate that the pest has been widely distributed in recent years by means of nursery stock. Sulphur compounds in dormant or delayed dormant sprays do not kill enough of the overwintering eggs to ensure a reasonable control throughout the season. On many occasions it has been found that *P. pilosus* multiplies more rapidly during the summer in orchards that have been dusted than in those that are regularly sprayed with lime-sulphur solutions. Petroleum sprays are much more effective and should be applied in the delayed dormant period or slightly later if safe. The 2 per cent. lubricating oil emulsions do not give a sufficiently high mortality to warrant their use in view of the rapid multiplication of the mites from the 10–12 per cent. of the eggs apparently unaffected by the emulsions. The heavier miscible oils are more effective than the lighter fractions in killing the eggs, and it has been found that the longer the applications can be delayed in spring the higher the mortality with the petroleum sprays. In the New England States it has been found necessary to apply petroleum sprays very thoroughly each spring, and even then, under favourable conditions, a certain amount of reinfestation occurs through the rapid development of broods or from mites transported by wind, etc.

CHANDLER (S. C.). **Codling Moth Hibernation Studies.**—*J. Econ. Ent.*, xxi, no. 2, pp. 315–318. Geneva, N.Y., April 1928.

Studies on the hibernation of *Cydia* (*Carpocapsa*) *pomonella*, L., in southern Illinois, during the winter of 1926–27, showed that 30 per cent. of the larvae on the trunks of trees that had not been scraped or banded hibernated between one inch above and one inch below the ground line, with an average of 1·5 larvae per tree. On trees that had been scraped and banded an average of only 0·6 larvae was found at or below the ground. The relatively small numbers of larvae found in heavily infested orchards may be explained by the feeding of birds, which have been found to remove fully 90 per cent. in southern Illinois. Fewer larvae occurred at the bases of banded trees that had been scraped down to the ground. The tendency is to leave at least an inch of the bark at the base untouched.

Examination of the ground between the trees showed that few larvae hide under natural cover and only bark is selected, even though most of the ground is covered with grass and dead leaves. Eight times as many larvae were found hibernating under artificial cover, thus emphasising the need of keeping the orchards cleared of all kinds of rubbish.

Tests with different strengths of fish oil soap emulsion and an emulsion of orthodichlorobenzene against the hibernating cocoons gave negative results.

ALDEN (C. H.) & YEOMANS (M. S.). **Codling Moth Control in Georgia Apple Orchards.**—*J. Econ. Ent.*, xxi, no. 2, pp. 319–324. Geneva, N.Y., April 1928.

For the past five years *Cydia* (*Carpocapsa*) *pomonella*, L., has caused very serious losses in the apple orchards of Georgia, as much as 75 per cent. of the fruit being injured in 1926. A vigorous campaign was therefore undertaken, with the result that infestation in commercial orchards was reduced from an average of 60 per cent. in 1926 to about 12 per cent. in 1927.

The dates of first pupation and emergence of spring brood moths in the insectary corresponded very closely with those in field cages, and with the exception of the first (calyx) spray, all applications were made at the period of maximum egg deposition as determined by the insectary records. In 1927 there were three broods and a partial fourth. The spring and first broods of moths were large, the following broods being smaller. A few of the first and second brood larvae, many of the third and all of the fourth went into hibernation. Such information must be obtained each year if spraying is to give the best results. It was found that *C. pomonella* would not oviposit when night temperatures fell below 60° F. and deposited very few eggs when the day temperatures reached a maximum of 90° F. or above. The following new spray materials were used in field experiments: scorodite, magnesium arsenate, tricalcium arsenate, manganese arsenate, aluminium arsenate and zinc arsenate. All gave poor results when compared with lead arsenate, and most of them scorched the foliage severely. Field experiments were also carried out with lead arsenate, calcium arsenate, dusts and oils. The best fruit was obtained from trees treated with lead arsenate (1 lb. to 50 U.S. gals.). Most varieties required six applications, the first two of lead arsenate and lime-sulphur and the other four of lead arsenate and Bordeaux mixture. Plots sprayed with lead arsenate yielded nearly 98 per cent. sound fruit, the best dusted plot 80 per cent. and the plot on which the last 5 applications contained ½ U.S. gal. white oil and ¼ lb. casein-lime in addition to the lead arsenate, 90 per cent. The control trees had 42 per cent. sound fruit, and the yield was very small. In two commercial orchards where the six lead arsenate and fungicide sprays were used, 87 and 89·2 per cent. of the fruit was sound ; in the previous year one of these orchards had nearly all the fruit infested and the other 75 per cent. Where this programme was used, the arsenical residue ranged from 0·028–0·035 grains per pound before and from 0·002 to 0·01 grains after cleaning.

In banding experiments a strip of unbleached sheeting of 3 thicknesses, 4 inches wide, treated with beta-naphthol and cylinder oil [*cf. R.A.E.*, A, xvi, 121] in the proportion of 1 lb. to 1 U.S. qt. gave the most promising results. Bands were placed on 63 trees on May 16th and were not treated again throughout the season. A few of these trees were examined at intervals of 10 days, and up to September 12th 1,356 larvae and 2 pupae had been found dead and 95 larvae and 5 pupae alive. Of those found alive, many had just gone under the bands and were killed after a longer exposure. The actual percentage found dead was 92·5, but since no empty pupa cases, indicating moth emergence, were ever found, it would seem that the actual percentage killed was probably higher. The cost of the treated bands was about a penny a tree, and since they remain effective for at least four months while the untreated bands must be removed every 10 days and the larvae killed by hand, the cost of labour is less.

Other control measures employed were scraping, thinning of the fruit and the cleaning of the orchard and packing sheds.

HOUGH (W. S.). **Relative Resistance to Arsenical Poisoning of two Codling Moth Strains.**—*J. Econ. Ent.*, xxi, no. 2, pp. 325–329. Geneva, N.Y., April 1928.

In the Grand Valley of Colorado and the Shenandoah Valley of Virginia the seasonal history of *Cydia* (*Carpocapsa*) *pomonella*, L., is very similar, even the times of oviposition of the different broods being nearly the same, but in the former region a minimum of seven and eight sprays are recommended, while in the latter three and four sprays give excellent control. Larvae from these localities were therefore reared for the purpose of testing their ability to enter fruit sprayed with lead arsenate at the rate of 4 lb. to 100 U.S. gals. water. In the experiments described the larvae from Colorado showed a much greater capacity for entering the fruit than those from Virginia. When the strains were crossed, the first generation of each cross was less resistant to arsenical poison than the pure strain from Colorado, but more resistant than the strain from Virginia.

REGAN (W. S.) & DAVENPORT (A. B.). **Some Results of three Years' Experience seeking better Control Measures for the Codling Moth in the Yakima Valley, Wash.**—*J. Econ. Ent.*, xxi, no. 2, pp. 330–337. Geneva, N.Y., April 1928.

During 1927 further tests were carried out with oil emulsions and lead arsenate sprays against *Cydia* (*Carpocapsa*) *pomonella*, L., on apples and pears [*R.A.E.*, A, xvi, 152]. Five different oil emulsions were tested. These contained 83 per cent. actual oil and varied from 62 to 100 per cent. saturation (refined) and from 50 to 107 seconds viscosity. In general the five oil emulsions showed good ovicidal action at the rate of 1 gal. to 100, and the poorest results with lead arsenate and oil in combination were better than those with lead arsenate alone, approximately 3–4 times as many apples being rejected in the latter case. These tests indicated, however, that there are limiting factors in the use of various types of oils. Both from the standpoint of control and of the ultimate effect upon the trees, it appears that well refined oils (85 per cent. and preferably higher) of moderate or fairly high volatility are preferable to oils of lower refinement and too low volatility, and even, in some cases, to a highly refined oil of low volatility. Oils that are too slowly volatile, if used too heavily, permit penetration and may cause discoloured, undersized fruit and even reduce bud formation and setting of fruit in the succeeding year. Weak, unthrifty trees also permit greater penetration. On the other hand oils that are too highly volatile are not likely to penetrate sufficiently to be effective against scale-insects. Oils of lower refinement cannot be used on fruit and foliage without considerable risk, and stunting of the foliage is almost certain to result from their continued use. Lighter oils spread more quickly, and their powers of penetration are more rapid, though not persistent; the films they form disappear completely in a matter of hours, while the films of heavier, less volatile oils may persist for days or weeks.

Among the thirteen oil spray experiments only one showed any ill effects. In this case five unusually thorough applications had been made on apples with a heavy, slowly volatile oil at a strength of 1½ gals. to 100, and resulted in the growth and possibly the colouring of the fruit being retarded. The amount and kind of emulsifier is to a large extent the determining factor in the production of safe and effective oil sprays; the difference in the method of emulsification is frequently the cause of variable results with the same percentage of actual oil. Correct emulsification inhibits oil penetration of foliage, fruit and bark, and by keeping the oil film upon the surface makes effective far weaker applications than those usually required.

Among the factors influencing the machine wiping and washing of fruit for the removal of spray residue are: the use of certain types of spreader that concentrate the lead arsenate in blotches when combined with oil; the use of oil and lead arsenate without spreader; the application of oil over heavily blotched lead arsenate; the use of an inferior grade of oil, which may cause russeting or spotting of the fruit, thus "setting" the lead arsenate into the skin in these spots; and the use of a heavy oil near the time of picking, allowing insufficient time for the oil to volatilise before wiping is attempted. There is, however, good reason to believe that with increased experience in the use of washing solutions and machinery, oil sprays will offer no material difficulty in the cleaning of fruit.

In one instance in a commercial orchard where four applications of a lead arsenate and oil spray were made on two very susceptible varieties of apples, using a volatile oil, only 5 per cent. were rejected, while in neighbouring orchards where the same schedule was followed using a similar dosage of lead arsenate without oil, some 25 per cent. were discarded. The use of the combination makes it possible to reduce the number of sprayings necessary to secure good control, and although the cost per tank is greater, the reduction in the cost of labour for fewer applications easily justifies the initial extra expense. The use of summer oil in this combination also has the advantage of reducing Aphid infestations, destroying young or migratory scale and controlling red spider [*Tetranychus*]. Tests also indicate that the total arsenical dosage needed may be reduced materially. Although in several cases good results have been obtained with oil alone, the long growing season in the case of apples and the need for frequent and heavy applications (in the case of heavily infested districts and more susceptible varieties) introduce factors that require further investigation. In the case of pears, experience has demonstrated that good control of *C. pomonella* can be secured by the use of summer oil with a greatly reduced dosage of arsenate and even with summer oil alone. When three applications of one of the heavier summer oils at the rate of 1½ gals. to 100 were made at intervals of approximately one month, only 1·9 per cent. of the fruit was rejected. When 3 lb. lead arsenate in 100 U.S. gals. was added to the oil in the first application, 1·7 per cent. was rejected. A conservative estimate of the unsprayed pears of the same variety that would be rejected in this locality is 25 per cent. No ill effects of any sort were noticed from these oil applications on pears, and the fact that pears are on the whole less susceptible to attack by *C. pomonella*, together with a shorter growing season, undoubtedly accounts for these results with oil sprays.

FROST (S. W.). **Continued Studies of Baits for Oriental Fruit Moth.**—*J. Econ. Ent.*, xxi, no. 2, pp. 339–348, 2 diagr. Geneva, N.Y., April 1928.

Further experiments on baits for the control of *Cydia* (*Laspeyresia*) *molesta*, Busck, were carried out in Pennsylvania during 1927 [*R.A.E.*, A, xv, 259]. From 10 to 24 pails were used in each test, one pail to every tree. Tests were carried out with a medium grade refiner's syrup and a low and high grade New Orleans molasses, and the results showed that the refiner's syrup at the rate of 1 part to 20 of water is superior to a dilution of 1 to 10, and that a dilution of 1 part to 10 of the high grade molasses is superior to a dilution of 1 to 20. These investigations again demonstrated that the sodium arsenite-molasses bait consisting of 1 part high grade molasses to 10 parts water with 5 gms. sodium arsenite to 1 U.S. gal. of the mixture gave much the highest catch. Further studies with additions of sodium benzoate have shown that it has little value. Tests with unfermented sugars and various salts of sodium indicate that neither the unfermented sugars nor the salt in the sodium arsenite-molasses bait accounts for its superiority, and the attractiveness must be due to some reaction between the molasses and the salt or possibly to a slight inhibition of the fermentation of the sugars.

Prolonged low temperatures and excessive precipitation both affect the catches of *C. molesta*, though it is not known whether the reduction in the numbers caught is due to the inactivity or checked fermentation of the bait, the reduction in the population of the moths or the inactivity of the adults. The effect of the surface tension of the bait in this connection is discussed. Water is of little use, for there is little or nothing to hold the moths that visit it. On the other hand molasses solution not only attracts, but through its reduced surface tension causes the moths to penetrate the surface and prevents them escaping. It was found that the surface tension of molasses solution was much lower than that of water, but much higher than that of sodium oleate solution. The production of alcohol, and later the production of acids in the fermenting sugar solution, both tend to reduce the surface tension. The number of pails necessary to yield the largest catch in a given area has not been determined, but it would appear that a pail on every other tree or about 50 pails to the acre will give a maximum catch. Other factors, such as the effect of other insects in the bait and of weekly and monthly collections of the insects, are also discussed. The effect of baits on subsequent infestation were inconclusive since the amount of fruit was low. A bait of refiner's syrup (1 part to 20), which is considered the best, lasts for a month under bad conditions and for at least two months under good conditions. The sodium arsenite-molasses bait lasts for 4–5 months under bad conditions.

CHAPMAN (R. N.). **Quantitative Results in the Prediction of Insect Abundance on the Basis of Biotic Potential and Environmental Resistance.**—*J. Econ. Ent.*, xxi, no. 2, pp. 349–352. Geneva, N.Y., April 1928.

The following is the author's abstract : One may not assume that a change in insect population has been caused by a change in some environmental factor unless it is known that when the environment is constant the population is constant. Results from constant population experiments [*R.A.E.*, A, xvi, 312] are compared with observations on the European corn borer [*Pyrausta nubilalis*, Hb.].

WEIGEL (C. A.), U.S. Bur. Ent. **Results of Forcing Hot Water Treated Narcissus Bulbs.**—*J. Econ. Ent.*, xxi, no. 2, pp. 352–353. Geneva, N.Y., April 1928.

Only an abstract of this paper is published. In some cases during the first year's experience, disastrous effects were noted after the treatment of dormant narcissus bulbs by immersion in hot water for three hours at temperatures ranging from 110 to 111·5 ° F. against *Tylenchus dipsaci*, Kühn, *Merodon equestris*, F., and *Eumerus* spp. In some cases these failures were thought to be due to planting the bulbs while they were still wet and hot, in others to planting the bulbs very early, when the soil temperatures were high and accompanied by either excessive moisture or dryness. Under such conditions it was thought that the bulbs were weakened and rendered more susceptible to diseases, which ultimately hastened their destruction. Others thought that failure was due to the possible overheating of bulbs, which may have occurred while they were in transit, or to improper storage. Further experiments were therefore conducted using paper-white narcissus treated at 110–111·5° F. These indicated that there was a general tendency towards better flower production in bulbs treated about 11th August, as compared with those treated on 1st September and 1st October. These bulbs will not tolerate a temperature of 115° F., the number of individual flowers on a spike being greatly reduced. In the case of various varieties of trumpet narcissus a very satisfactory crop of flowers was produced both from treated and untreated bulbs. In general the tests indicate that these varieties of bulbs can be given the hot water treatment without materially reducing the degree and quality of flowering. When the bulbs are treated at the right stage of growth and handled properly before and after treatment, they may safely be moved from one section of the country to another without great risk of loss.

BROADBENT (B.M.), U.S. Bur. Ent. **Developmental History of the Narcissus Bulb Fly at Washington, D.C.**—*J. Econ. Ent.*, xxi, no. 2, pp. 353–357. Geneva, N.Y., April 1928.

Further information on the life-history of *Merodon equestris*, F. (narcissus bulb fly) has been obtained from rearing experiments completed during the spring of 1927, and a comparison of the new data with the records for 1926 [*R.A.E.*, A, xv, 255] discloses differences in the duration of several of the developmental stages. It is shown by partial correlation that temperature and time of day are important factors influencing the activities of the flies. The average duration of the egg stage for the two years was 12·15 days at temperatures ranging from 17·1 to 20·5° C. [62·78–68·9° F.] Observations on the temperature and on the dates of pupation in spring indicate that in a normal year the larval period would probably average about 300 days. In studies lasting from 1925 to 1927, no evidence has been obtained that any larvae require two years to complete their development, though a very marked variation was found in the rate of growth of individuals of the same age even when feeding in the same bulb, which could easily lead to inaccuracy in estimating their ages. In 1927 the pupal period at temperatures of 11·8–13·2° C. [53·24–55·76° F.] lasted from 48 to 61 days; in 1926 it lasted 33–50 days at 12–15·7° C. [53·6–60·26°F.]. Eggs laid from 17th to 25th May 1926 produced adults that emerged from 4th to 20th May 1927.

FILINGER (G. A.). **Observations on the Habits and Control of the Garden Centipede,** *Scutigerella immaculata,* **Newport, a Pest in Greenhouses.**—*J. Econ. Ent.*, xxi, no. 2, pp. 357–360. Geneva, N.Y., April 1928.

During the last few years, the Symphylid, *Scutigerella immaculata,* Newp. (garden centipede) has proved a pest of considerable importance in the greenhouses of Indiana, Illinois, New York and Ohio. Lettuce, cucumbers, tomatos, sweet peas, snapdragons [*Antirrhinum*] and smilax growing under glass have been severely injured, and during the summer outdoor crops in the vicinity of the greenhouses have been attacked. Eggs are laid during the early part of the summer in subsoil runways, usually in clusters of 4–20. At room temperatures they hatch in about 14 days. The eggs and larvae are very briefly described, and the method of rearing is discussed. In its search for food *S. immaculata* does not seem able to make its own burrows through the soil and therefore uses earthworm burrows, cavities left by decaying roots and natural crevices in the soil. It may be spread in soil or manure brought into the greenhouse, or possibly by the exchange of plants. The fine root hairs or small rootlets are destroyed (thus stunting the plants and often killing them outright), small holes are tunnelled into the crown or into the roots of beets, carrot and radishes, etc., and any plant leaves that happen to lie flat on the ground are riddled with holes. The injury in greenhouses usually starts along the walls or paths, where the soil is undisturbed by cultivation. With the approach of warm weather in spring, *S. immaculata* moves down into the moist subsoil to the depth of about 18–36 inches, where it oviposits and spends the summer. It seems to be able to live for a long time on the organic matter in the soil. In the autumn when the crops begin to grow and the ground is moist, it returns to the upper layers of soil and feeds on the autumn and winter plant roots. Two species of true centipedes, *Lithobius forficatus*, L., and *Poabius bilabiatus*, Wood, prey on *S. immaculata*, and appear to have controlled this pest in one greenhouse. Where practicable, raised benches should be used in order to break the connection with the subsoil, where breeding apparently takes place. Thorough cultivation of the soil in the interval between the crops when the pest is still in the surface layer destroys many of the Symphylids and breaks up many of the burrows and passageways. When plants are first set out they should be watered lightly, as heavy watering makes worms, etc., come to the surface, leaving burrows for *S. immaculata*. Watering may be increased after the plants have been established. Paradichlorobenzene has proved a good soil fumigant. It should be applied in the summer or early autumn, when the pest is in the subsoil. The top layer of soil should be removed, the fumigant scattered over the subsoil at the rate of 1½ lb. to 100 sq. ft., taking care to avoid contact with the plant roots, and the surface soil replaced. The paradichlorobenzene serves as a barrier and many of the Symphylids are killed by the slowly generated gas. Steam sterilisation with the tile system when the pest is in the upper layers of soil is probably the most effective control measure. Lettuce seed will help to attract the pest to the surface. When it is observed feeding on the roots of the lettuce seedlings, the soil should be sterilised by heating a whole bed at a time if possible. All paths should be dug up to allow the heat to penetrate the soil. General sanitation and the correlation of the method of control with the seasonal activities of the pest are important.

Section of Apiculture.—*J. Econ. Ent.*, xxi, no. 2, pp. 360–416. Geneva, N.Y., April 1928.

This section includes the following papers: Area Clean up of Foulbrood, by F. E. Millen; *Malpighamoeba* (Prell) in the Adult Honeybee found in the United States, by J. W. Bulger; A Septicemic Condition of Adult Bees, by C. E. Burnside; and The Pathological Changes in Honeybees Infested with the Isle of Wight Disease, by E. J. Anderson.

The following is the author's abstract of the last paper: It was found that the mouth parts of the mite [*Acarapis woodi*] were sufficiently long to extend a relatively long distance through the tracheae and injure the surrounding muscle and nerve tissues. It would appear that paralysis could occur in the bees as a result of injury to these tissues, inflicted by the mite while feeding.

PLANK (H. K.). **The Lesser Corn Stalk-borer** (*Elasmopalpus lignosellus*, **Zeller**) **injuring Sugar Cane in Cuba.**—*J. Econ. Ent.*, xxi, no. 2, pp. 413–417, 3 figs. Geneva, N.Y., April 1928.

A moth recorded as injuring young ratoon sugar-cane in Cuba [*R.A.E.*, A, xiv, 542] was identified in 1927 as *Elasmopalpus lignosellus*, Zell. (lesser corn stalk-borer), the larvae and adults of which are briefly described. It was also found developing in sour grass (*Valota insularis*) growing between the rows of sugar-cane in infested fields. Its geographical distribution is briefly discussed. A list of the food-plants recorded in the United States [*R.A.E.*, A, v, 578] includes goose grass (*Eleusine indica*), which is common in the avenues between the cane fields in Cuba. The damage to sugar-cane was confined almost exclusively to fields in which the trash had been burned about a month after the crop had been harvested, thus destroying all the young shoots as well as the grasses. In the adjacent unburned fields only three very small infested shoots were found during the entire period of observation. This seems to show that a covering of trash is not favourable to the development of *E. lignosellus*. It serves to suppress the weeds, and such a check to the alternate grass food-plants may prevent the moth from reaching serious numbers; the burning of the trash may destroy parasites that would otherwise control the moth; or the trash may protect the young shoots, the bases of which are attacked.

Less than 10 per cent. of the infested stalks were found to contain borers, the majority spending most of their time in silky tubular runways outside the stalk. The highest infestations were found in May and June, a month or so after the trash had been burned, 62·1 and 55·1 per cent. of the shoots being injured in the two highest infestations. The largest average number of stalks on a stool found infested was approximately 14, but on a number of stools all the shoots were killed. Examinations made several months later showed a general weakened condition of the stools, doubtless due to excessive ratooning, and in some cases the stools had died. Injury by *Diatraea saccharalis*, F., was not found until the ratoons had been growing for about 1½ months, by which time practically all signs of infestation by *E. lignosellus* had disappeared. The length of the larval stage is not known, but the pupal period lasts 6–8 days. Pupation does not take place in the shoot, but may occur in the runway near the base of the stalk or in the loose soil close by.

Infestation by *E. lignosellus* does not persist in cane. It is confined to young shoots and stimulates excessive ratooning. It is probable that under favourable conditions of moisture the serious injury is the check to growth. Owing to the activity of the larvae and their habit of sheltering outside the tunnel in the shoot, no benefit is derived from removing " dead heart " shoots. Growth should therefore be stimulated by cultivation, particularly in dry weather, so that a sufficient number of young ratoons will be saved to ensure a stand.

Britton (W. E.). **Oil Sprays and Oil Injury.**—*J. Econ. Ent.*, xxi, no. 2, pp. 418–421. Geneva, N.Y., April 1928.

There is a decided tendency toward the increased use of oil sprays on shade and orchard trees, probably owing to their moderate cost and good powers of covering and penetration, and the ease with which they are applied. Experience in nearly all of the north-eastern States shows that, under certain conditions, trees have been injured by the application of oils. Peach and Japanese plum are particularly susceptible, while apple trees have been seriously injured in certain cases. Among the shade trees, sugar maple [*Acer saccharum*] seems to be the most susceptible, though tulip trees [*Liriodendron tulipifera*] are occasionally injured.

Miscible oils are the most effective dormant sprays for destroying the eggs of *Paratetranychus pilosus*, C. & F., *Bryobia praetiosa*, Koch, and probably those of *P. bicolor*, Banks (tree red spider), though they appear to be somewhat less effective in killing the eggs of Aphids. The miscible oils on the market may be roughly divided into four groups : lubricating oils with sulphonated vegetable oils and alkali ; sulphonated mineral oils with alkali ; lubricating oils with soap dissolved in phenols ; and lubricating oils with soap dissolved in alcohol. In general miscible oils containing alcohol and phenols are more apt to injure trees than the sulphonated oils. However, none of the miscible oils can be considered safe for application to foliage, though all of them at the proper dilutions will kill insects.

One of the most effective stock emulsions is made by boiling together 2 U.S. gals. lubricating oil, 2 lb. potash fish-oil soap and 1 U.S. gal. water until the soap is dissolved. The mixture should be churned vigorously through the small nozzle of a force pump until it thickens on cooling. Emulsions may be used on foliage at the proper dilution, and generally require only about half as much oil as the miscible oils to be equally effective. Under certain conditions of temperature and humidity, some injury follows the application of emulsions and it seems reasonable to suppose that the safest emulsion will finally be made from one of the " white oils." These are obtained from a high grade crude oil by distilling off the light oils such as kerosene, etc., and treating the residue with sulphuric acid ; a clear liquid separates out that is insoluble in the sulphuric acid and is called white oil. It is the most neutral or inert of all the oils.

The replies to a questionnaire on the subject of oil injury to deciduous trees are briefly tabulated.

MIDDLETON (W.), U.S. Bur. Ent. **Some Factors influencing Outbreaks of, and Control of, Shade-tree Insects.**—*J. Econ. Ent.*, xxi, no. 2, pp. 421–431, 4 refs. Geneva, N.Y., April 1928.

The author points out that insect infestations of shade trees are usually the result of a number of interrelated factors, which must be carefully considered if they are to be prevented or controlled. Several broad groups of conditions are discussed with illustrative examples. These include such factors as weather and its effect on insects and on the growth of the trees, the conditions under which the trees are growing or were formerly growing, and many features of insect behaviour.

HAMLIN (J. C.) & HAMLIN (M. S.). **An Inexpensive Method of protecting Household Refrigerators from Ants.**—*J. Econ. Ent.*, xxi, no. 2, p. 431. Geneva, N.Y., April 1928.

A method of keeping ants out of refrigerators that has been used with complete effectiveness for three years consists in standing the castors in small metal pans filled with a dry mixture of whiting and flowers of sulphur in approximately equal proportions. The mixture remained effective for 18 months without being replenished or disturbed. Should the pan become wet, it must be emptied and filled with fresh materials.

METZGER (F.W.). **Turpentine Oil as an Attractant of the Wheel Bug (*Arilus cristatus*, L.).**—*J. Econ. Ent.*, xxi, no. 2, pp. 431–432. Geneva, N.Y., April 1928.

During tests made to find an effective repellent for *Popillia japonica*, Newm. (Japanese beetle), it was discovered that turpentine oil U.S.P. was strongly attractive to *Arilus cristatus*, L. (wheel bug). When the can containing the oil was moved to a new position, the bugs readily moved after it. At no time were they seen at any other point in or near the orchard.

SALMAN (K. A.). **Notes on *Phlebatrophia mathesoni*, MacG. in Maine (Hym. Tenthredinidae).**—*J. Econ. Ent.*, xxi, no. 2, p. 432. Geneva, N.Y., April 1928.

During the summer of 1927 larvae of the leaf-mining sawfly, *Phlebatrophia mathesoni*, MacG., were found to be heavily infesting the foliage of *Betula alba* (white birch) and *B. populifolia* (grey birch) on Mount Desert Island, Maine. This is apparently the first published record of this pest in the United States. The adults were observed in numbers on 30th June. The eggs are inserted in the marginal tissues of the leaf between the upper and lower epidermal layers, and the tissues surrounding the point of insertion become browned and dry. On 23rd June few evidences of oviposition were noticed, but by 3rd July they were common although no adults were observed ; a few examples of this injury were also found on alder. Larvae, which were found in the leaves from 10th July onwards, completely separate the epidermal layers by their feeding. They hibernate in a circular disk-like hibernaculum made by fastening the epidermal layers together ; these were first found about the middle of September.

Long (W. H.). **Why only Staminate Box-elders should be used for Shade Trees.**—*J. Econ. Ent.*, xxi, no. 2, pp. 433–434. Geneva, N.Y., April 1928.

The use of box-elder (*Acer negundo*) as a shade tree in the south-western United States has been declining during recent years, owing mainly to its infestation by *Leptocoris trivittatus*, Say. In the autumn the bugs leave the trees and invade neighbouring buildings in search of warm and protected winter quarters, thus causing extreme annoyance to householders. The same trouble occurs in spring during the alternate warm and cold spells common at that time of year. Sometimes a third invasion takes place in August when the bugs on the trees are very numerous. At this time the adults are pairing and seeking places for oviposition, and the immature forms leave the heavily infested trees to crawl on to neighbouring fences and buildings, possibly in search of a fresh food supply. For several years observations have shown that the bugs were present only on the pistillate trees, even when staminate trees were so close that the branches touched. On 1st August many bugs were seen pairing on the seeds, and two or three days later hundreds of eggs were found, in every instance on the fruit, usually in groups of 6–8, one bunch of eggs to each group of fruit. Even during the oviposition period many nymphs of all ages were seen feeding on the succulent fruit. The use of the fruits for oviposition and for food by the newly hatched young and even by nymphs of all ages, explains why the insects are usually found only on the fruit-bearing trees. The author suggests that nurserymen should propagate this tree from cuttings of staminate trees only, since these could be used as shade trees without the danger of infestation by *L. trivittatus*.

Siegler (E. H.) & Brown (L.), U.S. Bur. Ent. **Longevity of the Codling Moth Larva.**—*J. Econ. Ent.*, xxi, no. 2, p. 434. Geneva, N.Y., April 1928.

Experiments with larvae of the codling moth [*Cydia pomonella*, L.] in cocoons kept at low temperatures from the autumn of 1925 until the spring of 1927 seem to indicate that in spite of the most adverse weather conditions likely to occur in an orchard (which would tend to prevent transformation and to prolong larval life) larvae would have insufficient vitality to live through two winters and subsequently perpetuate the species.

Smith (H. S.). **The Native Home of the Citrophilus Mealybug.**—*J. Econ. Ent.*, xxi, no. 2, pp. 435–436. Geneva, N.Y., April 1928.

In the United States *Pseudococcus gahani*, Green (citrophilus mealybug) was first found established in the vicinity of San Francisco, and it was thought that it probably originated in one of the countries maintaining direct steamship communication with that port. A search was therefore made in these countries in the hope of finding its native home and incidentally its natural enemies. It was eventually found at Sydney, where it was heavily parasitised, and since at least three different species of internal parasite appeared to be confined to this host, it is thought that it is probably a native of Australia.

While heavy infestations of this mealybug are almost invariably controlled by the use of *Cryptolaemus* [*montrouzieri*, Muls.], it is not always easy to prevent a light infestation from becoming heavy and so causing injury. It has been demonstrated in the case of the common mealybug [*P. citri*, Risso] that specific internal parasites are more satisfactory for this purpose than predators, since they are better able to search out and destroy individual mealybugs, and it is hoped that at least one of the parasites discovered will fill this need in the case of *P. gahani*.

DURHAM (G. B.). **Pollen Carriers on Summer Squash,** *Cucurbita pepo*.—*J. Econ. Ent.*, xxi, no. 2, p. 436. Geneva, N.Y., April 1928.

For several years controlled pollination work on *Cucurbita pepo* has been hindered to a slight extent by insects smaller than bees entering tied bags after artificial pollination of blossoms. Investigations showed that *Diabrotica vittata*, F. (striped cucumber beetle) is a strong competitor with bees in the pollination of *C. pepo*, and that more pollen clings to the insect on humid days or in the morning before the dew dries.

MARCOVITCH (S.). **Lime and Sodium Fluosilicate.**—*J. Econ. Ent.*, xxi, no. 2, pp. 436–437. Geneva, N.Y., April 1928.

In the past hydrated lime has been recommended as a carrier for sodium fluosilicate, and in the absence of moisture the lime acts as a neutral carrier. If, however, dew is present on plants at the time of dusting, the lime dissolves and reacts with the sodium fluosilicate to form the soluble calcium fluosilicate, which may cause injury to the foliage. In the presence of moisture a neutral carrier such as flour, talc, sulphur or infusorial earth has been found much safer. Considerable injury was caused to wet cucumber foliage when hydrated lime was used alone, and if this is the only carrier available, care should be taken to apply the dust when there is no dew on the foliage. A dry dust that stimulates the "cleaning habit" appears to be more effective against adult bean beetles [*Epilachna corrupta*, Muls.] or cucumber beetles [*Diabrotica*] than dust wetted by dew or moisture.

MORRILL (A. W.). **Sonora Cotton Square Dauber** (*Creontiades debilis*, **Van D.**).—*J. Econ. Ent.*, xxi, no. 2, p. 437. Geneva, N.Y., April 1928.

Creontiades debilis, Van D. (Sonora cotton square dauber), which was first observed injuring cotton in the Yaqui Valley (Mexico) in 1925, heavily infested a field of 400 acres in 1927. The Capsids were only present in small numbers in June, but by 3rd August 90 per cent. of the blooms were attacked. Unlike the Capsids (*Lygus* spp.) on Egyptian cotton in Arizona, these insects caused little shedding of the squares, and it is suggested that this may be a characteristic of the variety of cotton. The principal damage was done to young bolls, some of which were shed, while others continued to develop with interiors more or less destroyed. On 3rd August 60 per cent. of the bolls had one or more locks damaged, while on the basis of locks it was estimated that 49 per cent. showed injury. A final estimate of the damage on 15th September showed that the crop, which would probably have averaged about 1½ bales to the acre, was reduced by nearly 50 per cent. On the same date 92 per cent. of the blooms were free from injury, and the Capsids were proportionally scarce. The damage throughout the Yaqui Valley, where a total of 3,000 acres was planted, amounted to 15 per cent. of the crop.

McDaniel (E. I.). **Two Spruce Chermes infest Michigan Spruce.**—*Quart. Bull. Michigan Agric. Expt. Sta.*, x, no. 3, pp. 128–131, 3 figs. East Lansing, Mich., February 1928.

Various species of spruce in Michigan are attacked by *Chermes abietis*, L. (spruce gall aphis) and *C. similis*, Gill, which produce galls, resembling cone-like growths, at the tips of the twigs. The galls formed by *C. abietis* remain green until the emergence of the Aphid, about the middle of August, and then turn brown, remaining on the trees for several seasons ; *C. similis* forms loose terminal galls at the tips of the new growth, which ripen about 2 weeks before those formed by *C. abietis* and cause the terminal shoot to turn brown and die. Neither of these two species appears to attack other varieties of trees ; they apparently prefer individual trees from which the infestation does not spread rapidly.

On ornamental plantings these Aphids may be controlled by hand-picking the galls before they emerge ; where this is impossible, the trees should be sprayed in the spring before the new growth starts with miscible oils (1 : 20), 2 per cent. oil emulsion, or 1 U.S. pint 40 per cent. nicotine sulphate, 4 lb. soap and 100 U.S. gals. water. Oil sprays are specially recommended where trees are also infested with *Paratetranychus ununguis*, Jac. As these Aphids largely hibernate at the tip ends of the limbs and on the lower surface, care should be taken that these are reached by the spray. The use of any of the above sprays will remove the " bloom" from the trees, rendering the foliage an almost uniform green.

McDaniel (E. I.). **Cockroaches, Silver-fish and Book-lice.**—*Circ. Michigan Agric. Expt. Sta.*, no. 101, 12 pp., 3 figs. East Lansing, Mich., April 1928.

This is one of a series of popular bulletins on household pests, and gives some account of cockroaches, the silver-fish, *Lepisma saccharina*, L., and *Thermobia domestica*, Berg., and the book-lice (Corrodentia), with suggestions for their control.

Grossman (E. F.). **How the Boll Weevil ingests Poison.**—*Bull. Florida Agric. Expt. Sta.*, no. 192, pp. 147–172, 6 figs., 18 refs. Gainesville, Fla., January 1928.

A detailed account is given of experiments on the poisoning of *Anthonomus grandis*, Boh. (cotton boll weevil) with calcium arsenate, many of the results of which have already been noticed [*R.A.E.*, A, xiii, 258 ; xv, 587]. It was found that plots treated with a mixture of equal quantities of calcium arsenate and hydrated lime yielded as much seed cotton to the acre for three consecutive years as those treated with undiluted calcium arsenate.

REINHARD (H. J.). **Hibernation of the Cotton Flea Hopper.**—*Bull. Texas Agric. Expt. Sta.*, no. 377, 26 pp., 9 figs. College Station, Texas, February 1928.

Studies on the hibernation of the cotton flea hopper [*Psallus seriatus*, Reut.] were made during the seasons 1925–27 in Texas. Hibernation occurs in the egg stage, and minimum temperatures of 20° F. did not kill the dormant eggs, which hatch in spring when the mean temperature reaches 58–60° F. When climatic conditions are at their optimum, hatching proceeds rapidly. Wind appears to be the most important factor in disseminating the insects. Tables show the rates of hatching on various food-plants. There is a definite relation between the time of maximum emergence and the extent of injury to cotton. Normally the heaviest emergence from hibernation occurs before young cotton is up in the field, and little or no injury to the crop results; when climatic conditions delay emergence and cotton is planted at the average date, severe injury generally occurs. Fourteen new winter food-plants have been discovered, and these include the commonest weeds and have a wide distribution throughout the State.

The Japanese Beetle in New York State.—*Circ. N. Y. Dept. Agric. & Mkts.*, no. 324, 19 pp., 8 figs. [Albany, N.Y.] March 1927.

As *Popillia japonica*, Newm. (Japanese beetle) was found to be established in the south-east of New York State in 1926, the problem presented is briefly discussed and the text of a State Quarantine, which came into force in May 1927, and follows the lines of the Federal one [*R.A.E.*, A, xv, 297] is given.

[**Report on Entomological Work, 1925–26**].—*Bull. Arkansas Agric. Expt. Sta.*, no. 215, pp. 39–41. Fayetteville, Ark., November 1926.

Tests were made to determine the usefulness of tracing the spread of infestations of the cotton boll weevil [*Anthonomus grandis*, Boh.] from areas infested by hibernating weevils, the value of following the development of broods as an aid to timing dust applications, the effectiveness of dust as a barrier to migrating weevils, and the value of repressing scattered infestations in a field and delaying the dusting over the whole field until a serious threat of injury was first noticed. The tests were made on two plantations that had previously been heavily infested. It was found that practically all the mid-season infestation could be traced to areas infested by hibernating weevils; no complete break was observed between the period of infestation by the hibernating and the first generations; and dusts applied on and around areas infested by these weevils prevented the migration of the weevils and suppressed the infestation to such an extent that the cotton continued to fruit until about 12th August, when the general migration of the weevils began. Various plant bugs on cotton also attracted attention [*R.A.E.*, A, xvi, 320].

A graph is given showing the rate of emergence of the spring brood of adults of the codling moth [*Cydia pomonella*, L.] in 3 day periods. Spraying recommendations were based on the deposition of eggs by moths bred out from overwintering larvae; the calyx spray and three cover sprays were directed against the larvae of the first generation, and four further ones against the subsequent broods. These gave very good results, 90·24 per cent. of the apples in the best plot being free from infestation.

MAHEUX (G.). **[Report of the Provincial Entomologist.]**—*Rep. Minist. Agric. Prov. Quebec 1926–27*, pp. 194–208, 2 pls. Quebec [1927].

A list is given of the harmful insects observed during the year under review, with indications of their distribution and the extent of the damage done by them. Against *Pyrausta nubilalis*, Hb., a programme has been drawn up, which is given verbatim, and includes quarantine notices and an appeal to growers to build silos, as it is believed that this is the most effective way of preventing the propagation of the borer. The invasion of the gipsy moth [*Porthetria dispar*, L.] has been definitely arrested owing to the spraying done in the previous year around the centre of the infested area.

GORHAM (R. P.). **A Method of Collecting Living Moths at Sugar Bait.**—*Canad. Ent.*, lx, no. 5, p. 103. Orillia, Ont., May 1928.

Noctuid moths feeding at a sugar-bait may be collected in small vials held over an electric torch in such a manner that the light shines through the bottom of the vial only. When the vial is held near the bait, the moths enter and remain in it until the light is removed. Moths of the genus *Catocala* were collected in the same manner in a wide mouthed bottle, chloroform being placed in holes in the cork.

COOK (W. C.). **Light Traps as Indicators of Cutworm Moth Population.**—*Canad. Ent.*, lx, no. 5, pp. 103–109. Orillia, Ont., May 1928.

The author's conclusions are as follows:—This study, while admittedly incomplete, demonstrates conclusively that there are limits to the use of light-traps as indicators of the cutworm moth population. When a sufficiently large number of catches are averaged, this average will bear a definite relation to the moth population. In this particular instance, about half as many moths are caught in the trap, per hour, as in collecting at flowers nearby. Not all the species present are captured, and probably ten per cent. of the total would escape a permanent trap. The moths do not come to light in proportion to their abundance as species. There is a definite gradation from strongly phototropic species to those that are negative to light. Further study is needed on this point, as light-traps are very widely used as indicators of the relative abundance of species.

These short collections are only fairly reliable for indicating inter-annual variations in population, and a permanent trap may be regarded as much more reliable.

GOWDEY (C. C.). **Report of the Government Entomologist.**—*Ann. Rep. Dept. Agric. Jamaica 1927*, pp. 20–21. Kingston, 1928.

Cosmopolites sordidus, Germ., appeared on bananas in a new locality; in experiments, a crude form of paradichlorobenzene showed 75 to 85 per cent. effectiveness against it in a badly infested area. This was also successful against the larvae of the root-weevils, *Pachnaeus* and *Prepodes*, on *Citrus*. A new food-plant of *C. sordidus* has been discovered in *Xanthosoma sagittifolium*. Against Coccids on *Citrus* [*R.A.E.*, A, xv, 662] a proprietary oil spray resulted in a mortality of 98 to 99 per cent. *Aleurocanthus woglumi*, Ashm., and *Papilio thoas melonius*, Cram., were also troublesome on *Citrus*. The only serious pest of maize was *Heliothis* (*Chloridea*) *obsoleta*, F., and of coffee, the leaf-miner, *Leucoptera coffeella*, Guér. The loss among mangos due to *Anastrepha fraterculus*, Wied., was still appreciable, but was considerably less than in previous years when the fallen fruit was left under the trees and guavas and plums were left as breeding-places. *Aleurodicus pimentae*, Lg., is only known to occur in Jamaica, where it was discovered about three years ago. The eggs are laid on the lower surface of pimento leaves, the numbers varying from 350 to 750, and hatch in 6–9 days. The larval stage lasts 22–26 days, and the pupal 15–25. Much honeydew is secreted during the larval and pupal stages. Reproduction may be parthenogenetic. *Citrus* is also attacked. The natural enemies of this Aleurodid include the larvae of *Chrysopa thoracica*, Wlk., and of a microlepidopteron and the Coccinellid, *Lioscymnus diversipes*, Champ. The twig-girdler, *Psiloptera torquata*, Dalm., var. *jamaicensis*, Fish., caused considerable damage on pimento in one locality.

On sugar-cane, *Stenocranus saccharivorus*, Westw., was in some districts the most important pest between December and March, which are dry months, when the fungus, *Fusarium* sp., does not infest it. Minor pests were *Cirphis latiuscula*, H.-S., *C. humidicola*, Guen., *Laphygma frugiperda*, S. & A., *Remigia* (*Mocis*) *disseverans*, Wlk., and *R. punctularis*, Hb. (*M. repanda*, auct.), and isolated infestations of the Aphid, *Sipha flava*, Forbes, and *Eutermes* (*Leucotermes*) *ripperti*, Ramb. occurred. Sweet potatoes were attacked by the bug, *Corecoris fuscus*, Thunb., which was controlled by dusting with calcium cyanide, and *Cylas formicarius*, F., var. *elegantulus*, Pierce, was troublesome in several districts and also attacked sweet cassava [*Manihot palmata*] on land previously planted with sweet potatoes.

MALENOTTI (E.). [**Articles on** *Pyrausta nubilalis* **and its Control.**]—*Contadino della Marca Trevisana*, 1927, nos. 45 & 50, 1928, no. 13, reprints, 4, 3 & 5 pp., 8 figs. Treviso, 1927 & 1928.

Maize in the region of the Lower Piave is seriously attacked by *Pyrausta nubilalis*, Hb. The first of these popular articles briefly describes the adult and larva and the infestation in the maize stalks. The heaps of stalks left on the farms constitute the best possible shelter for this moth. In the damp weather that prevails in autumn and winter in Venetia, it is not possible to dry the stalks and thus destroy the larvae, but they may be passed through a forage cutter and used as fodder or fuel before the end of March. If the stalks are used as stable litter, it must be piled in manure-heaps after use before the end of March, so as to kill the surviving larvae. Any stalks left over at that time should be fumigated under tarpaulins with carbon bisulphide at the rate of 50 gms. per cu. metre.

The losses in Venetia due to this pest are estimated at over £100,000 a year.

The third paper reproduces the decree issued on 11th February 1928 by the Italian Ministry of National Economy, rendering compulsory the destruction by burning of any maize stalks still remaining after 31st March 1928. The remainder of the article briefly surveys the position regarding this pest in the United States and Hungary, etc.

THOMPSON (W. R.) & PARKER (H. L.). **The European Corn Borer and its Controlling Factors in Europe.**—*Tech. Bull. U.S. Dept. Agric.*, no. 59, 62 pp., 3 figs., 18 refs. Washington, D.C., April 1928.

The following is largely taken from the authors' summary : *Pyrausta nubilalis*, Hb. (European corn borer) is very generally distributed throughout Europe, but is rarely of economic importance except in certain of the central areas, and although sporadic outbreaks occur from time to time on maize, hops, hemp and other crops, the borer is normally controlled over the greater part of the Continent by a complex group of agricultural, meteorological and parasitic factors. The variation in the composition of the fauna parasitic upon *P. nubilalis* in different zones is often considerable, depending on the variations in its limiting factors, and species that are sometimes parasitic on *P. nubilalis* may exist outside the range of that host, or may occur in the same zone as the borer without attacking it, being at that point parasitic on some other insect. Areas in which parasitism is high are not necessarily those in which *P. nubilalis* is least injurious, and *vice versa*. The theory that an insect pest, in order to be kept in control, must be attacked in its successive stages by a series of parasites has not been borne out by the present investigations. The absence of any definite correlations between the qualitative or quantitative importance of the parasitic fauna of *P. nubilalis* and the degree of economic damage produced should not, however, be taken as an indication that the work of the parasites is of no importance. Since control in any given region results from the action of all the factors working together, it seems reasonable to assume that the absence of any constant cause of mortality will disturb the natural equilibrium and permit an inevitable though perhaps gradual increase in numbers until great economic injury results. With these considerations in mind, it is not to be expected that all the species introduced into America will become acclimatised in any particular zone inhabited by the borer. The bionomics and distribution of the 20 parasites (including two protozoa) discovered during the investigations in Europe are discussed ; recoveries of those introduced into America indicate that the acclimatised species (*Eulimneria crassifemur*, Thoms., *Dioctes punctoria*, Rom., *Microgaster tibialis*, Nees, *Pimpla* (*Exeristes*) *roborator*, F., and *Phaeogenes planifrons*, Wesm.) are very much the same as those occurring in the Po Valley. In order to obtain the best results, the species not yet acclimatised should be re-introduced as the borer reaches areas differing climatically from those now infested ; such a method is more likely to result in a general re-establishment of the natural equilibrium than a few colonisations in the same area.

Thompson (W. R.) & Parker (H. L.). **Host Selection in** *Pyrausta nubilalis*, **Hübn.**—*Bull. Ent. Res.*, xviii, pt. 4, pp. 359–364. London, May 1928.

In view of the differences of opinion regarding the inheritance of acquired characters in insects and the validity of Hopkins' host-selection principle, experiments were carried out in the summer of 1927 at Hyères on host selection in *Pyrausta nubilalis*, Hb. Two strains of moths were reared in insectaries, one from larvae collected from maize in south-west France and one from *Artemisia vulgaris* in the vicinity of Paris. As conditions in these two regions have been relatively stable for a long time, these two strains should naturally have been confined for many generations to their respective food-plants, the opportunity for admixture being practically negligible as their habitats are separated by a broad belt in which neither food-plant is abundant. The method of conducting the experiments is described. The individuals of *P. nubilalis* taken from *Artemisia*, in spite of their long association with the plant, which may indeed be the original food-plant of the species, showed no striking preference for it, but deposited the majority of their eggs on maize, exhibiting only a very slight preference for *Artemisia* even when conditions in the experiment were distinctly favourable to that plant. The tests clearly indicate that of the two plants used, maize is the favourite food-plant of both strains of *P. nubilalis*. However, the proportion of egg-masses deposited upon maize by the *Artemisia* strain was 14 per cent. lower than by the strain from maize, and *Artemisia* did exert a positive attraction on the individuals obtained from that plant, while it had none for those obtained from maize, though it received eggs just as did the woodwork of the cages. To some extent, therefore, these experiments bear out the Hopkins host-selection principle, but the preference shown by the females in these tests does not prove the inheritance of acquired characters, as the adults used were not merely the offspring of parents inhabiting *Artemisia* and maize, but individuals that had themselves developed in the respective food-plants.

Box (H. E.). **The Introduction of Braconid Parasites of** *Diatraea saccharalis*, **Fabr., into certain of the West Indian Islands.**—*Bull. Ent. Res.*, xviii, pt. 4, pp. 365–370, 1 pl., 2 figs. London, May 1928.

A further detailed account is given of the collection, rearing, shipment and introduction of Braconid parasites of *Diatraea saccharalis*, F., into Porto Rico and also into Barbados, Antigua and St. Kitts, where the borer is a serious pest causing losses varying from 10 to 25 per cent. to the sugar industry [*R.A.E.*, A, xv, 412]. One of the Braconids, *Microdus diatraeae*, Turner, has already become established on the south coast of Porto Rico, and the present paper deals chiefly with the introduction of *Iprobracon grenadensis*, Ashm. This preliminary work in the West Indies and the success already obtained in Porto Rico indicate possibilities of at least partial control of the borer. As the adults of *Iprobracon* are much attracted by a form of honey-dew secreted on the leaves of *Cordia interrupta*, it is suggested that these plants should be grown in the hedges around canefields where introductions of the parasite have been made.

Wilkinson (D. S.). **On three Braconid Parasites of the Gelechiid Moth,** *Platyedra erebodoxa*, **Meyr.**—*Bull. Ent. Res.*, xviii, pt. 4, pp. 391–395, 2 figs. London, May 1928.

Descriptions are given of *Microbracon hancocki*, sp.n., *Chelonella ritchiei*, sp.n., and *Apanteles diparopsidis*, Lyle, all of which have been bred in Uganda from *Platyedra erebodoxa*, Meyr., and a key is given to the Ethiopian species of *Chelonus* and *Chelonella*. Two Hymenoptera were also reared and are presumably hyperparasites ; these have been identified as a species of *Eurytoma* and one of *Calliceras*, Nees (*Ceraphron*, Jurine). In notes by G. L. R. Hancock, who bred the parasites, it is stated that *P. erebodoxa* occurs in Uganda in areas north and north-west of Lake Victoria, probably following the distribution of its food-plant, *Hibiscus diversifolius*, the larvae being found at all times in the seed-heads. The eggs of *M. hancocki* appear to be deposited in batches of about 3 to 5, being laid beside the larva in the capsule near the posterior end of the host. The incubation period is probably about 48 hours, and the larval stage occupies from 4 to 5 days, after which the cocoon is spun, pupation taking place 1 or 2 days later. The cocoons are spun, generally two or three together, at the base of the capsule, and the adults emerge after 10 days. The maximum female life in the laboratory lasted 12 days, while the males lived from 2 to 9 days. Larvae, taken from the original host and transferred to another, died, being unable to penetrate it; it is therefore probable that the parasite paralyses its host before oviposition.

Ballard (E.) & Evans (M. G.). *Dysdercus sidae*, **Montr., in Queensland.**—*Bull. Ent. Res.*, xviii, pt. 4, pp. 405–432, 1 pl., 1 plan, 7 figs. London, May 1928.

Dysdercus sidae, Montr., is a serious pest of cotton, not only staining the lint but also acting as the agent by which fungi enter the green cotton boll. *D. sidae* and *Tectocoris lineola*, F., are the chief insects causing this damage in Queensland. The time of appearance of *D. sidae* in the field is variable, depending apparently less on the condition of the cotton than on the fruiting of wild food-plants, drought or excessive rain. A good cotton season is generally favourable for *Dysdercus*, and in these circumstances green bolls developing from January onwards are sure to show a high percentage of stain as the season advances, until some 80 per cent. of the top crop is practically worthless.

A study of the life-history has been carried on during two seasons, and a description of the stages is given. No feeding occurs in the first instar, but all subsequent stages feed on seeds of Sterculiaceae and Malvaceae, though the later stages show a desire for green food, and adults must, except when fed on the seed of cotton or *Brachychiton*, have a mixed diet of ripe and unripe fruit in order to become sexually mature and lay fertile eggs. The eggs are always laid in a mass in the ground in loose soil to a depth of one inch or under some light protection. A female will continue oviposition throughout life after a single fertilisation, but in cold weather the intervals between egg depositions become longer. Observations of oviposition in the laboratory are recorded, and tables are given showing the numbers of eggs laid in winter and summer when the parents were fed on different food-plants. In cotton fields all stages except the first instar feed on the seeds of open or just opening cotton bolls. Adults feed on the green bolls, sometimes only piercing the boll wall and sometimes thrusting the stylet far in, trying to reach the seeds. There is no evidence that they are attracted to cotton from any distance, or that the opening of the bolls plays any part in attracting them. While *Abutilon* was available, the bugs continued to feed upon it, leaving an adjacent field of cotton full of opening bolls untouched. On open bolls, they prefer the seeds at the base ; nymphs will always choose split kernels rather than unhusked cotton seed, but this method of attracting them is hardly practicable as a control measure owing to the large number of traps that would be required. Observations indicate that the attractiveness of any particular type of food does not extend over more than a yard or two at most, and shade and moisture seem to be more powerful attractants than food. Terpineol and trimethylamine were found to act as repellents rather than attractants, and there was marked aversion from citronella oil; neither refined nor crude cotton seed oil was attractive. Cannibalism occurs commonly in the field, especially among diseased insects.

The responses of *D. sidae* to climatic changes have been studied, but it was impossible to gauge the influence of differing relative atmospheric humidity at constant temperatures. Low humidity retarded incubation to some extent. In the incubator, temperatures of 104° F. and over proved fatal to adults and eggs. Eggs were killed at mean temperatures between 90 and 96° ; nymphs survived rather higher mean temperatures. Torrential rains are fatal to the eggs and earlier instars ; eggs failed to hatch either in extreme dryness or when kept in a saturated soil for 24 hours. Atmospheric conditions in Queensland should, on the whole, be favourable to *Dysdercus*, as the humidity is generally high and extremes of temperature are rarely experienced. In all cases except the 2nd and 3rd instars the optimum temperature appears to be between 84 and 85° F. ; mean temperatures above 95° were generally fatal. Adult stainers appear capable of surviving any winter temperature likely to occur in the Queensland cotton districts, and nymphs of the 5th instar survived the cold weather and produced healthy but rather dark-coloured adults in the spring. Hibernation does not apparently occur, but temporary shelter may be sought during extreme cold or excessive rain ; the bugs feed throughout the year, even at elevations up to 1,000 ft.

Observations on the migration of *D. sidae* are described in detail, especially the particular migrations from one large bottle tree (*Brachychiton rupestris*). While the majority of males migrated, many more females than males stayed behind, apparently depending on the arrival of migrating males from some other area. There are indications that there is a first true migration flight (restricted to certain individuals of a generation), which may be to a distance of a mile and seems to have as its objective a new breeding-ground beside a water-course ; this initial flight is generally followed almost at once, or after an interval for feeding and pairing, by shorter flights from one food patch to another. These subsequent flights seem to be influenced entirely by the search for food or a mate. Migrants arrived on cotton during the third phase of the migration, when cotton was only one of the available food-plants with no special attractive properties. Having arrived there, they probably stayed until the end of their life, depositing several batches of eggs. It was possible to predict accurately the appearance of nymphs in the new breeding-grounds by the time-temperature charts of the laboratory, and also the time at which these descendants of the bottle-tree migrants would themselves prepare for migration. There are many further points that require elucidation, such as the fruiting seasons of various members of the Sterculiaceae and the possible food-plants of the last developing individuals of a season.

Two Tachinid parasites, *Alophora aureiventris*, Curr., and *Catharosia varicolor*, Curr., attack the adults, and other enemies are a Reduviid, a Mantid and mites. The last-named destroy the wings and ovaries and would therefore affect migration. No egg parasites have been found.

The problem of controlling *D. sidae* remains without any solution. The impracticability of applying any of the methods that would naturally suggest themselves is explained. It would be advantageous to devise a type of adhesive strong enough to hold the fifth instar nymphs when it is smeared on the sheltered places in which they tend to congregate for moulting, or a lure powerful enough to attract adults from a greater distance than has been possible up to the present.

McCarthy (T.). **The Wheat Root Grub** (*Anodontonyx tetricus*).—*Agric. Gaz. N.S.W.*, xxxix, pt. 4, pp. 306–313, 7 figs. Sydney, 1st April 1928.

The Melolonthid, *Anodontonyx tetricus*, Blkb. (wheat root beetle), a species native to Australia, was first recorded as a definite pest of wheat in New South Wales in 1925 [*R.A.E.*, A, xvi, 347]. The beetles show a preference for freshly turned soil, and it is therefore concluded that the practice of fallowing, which has recently come into more general use, is likely to have influenced its appearance in wheat crops. Soil worked a few weeks before the appearance of the beetles, or land free from natural growth, is more attractive than stubble or grass land. Wheat and oats are the only economic plants attacked, and injury has only been observed in red soils. In white or grey soils the larvae have never been sufficiently numerous to cause noticeable injury, while wheat growing on black soils has never been found to be infested. The presence of the larvae in a crop is indicated by patches of poor growth in the wheat, which eventually become bare as the young plants die, the injury being caused by the larvae feeding on the roots and gradually cutting them off from the stem. Crops affected by drought suffer more severely than those of vigorous growth, and injury has in all cases been of a scattered character.

Most of the adults appear between 25th November and 15th December, a few emerging as late as January. They congregate on any available object and are most numerous on sunny days from 3 to 5 p.m., after which they return to the soil. They sometimes annoy men and horses to the extent of causing temporary suspension of harvesting operations. Though capable of long flights, they usually content themselves with short rapid ones, and in the presence of wind and limited sunshine remain comparatively stationary. At daybreak, when the soil is cold, they were observed in a torpid condition at depths varying from 2 to 6 inches, becoming more active as the day advanced and the temperature rose. They have never been observed to feed above ground and apparently emerge for mating, the process occupying only about 10 seconds, in contrast to the lengthy period that occurs in some other Melolonthids. In the laboratory eggs were laid in clusters

2–4 inches below the surface in cavities made by the female. Most of the eggs are probably laid in the first half of December, as the pre-oviposition period was observed to be about 10 days and the life of the adult is short. The maximum number of eggs found in one female was 66.

The larval stage lasts approximately 10 months, the larvae feeding in the early stages on the roots of weeds and grasses and upon decaying organic matter in the soil, on which it is possible for them to subsist entirely. They are about two-thirds grown when they first attack the young wheat, soon after it germinates in April or May, and the damage becomes definitely apparent in July or August. During the day the larvae remain about 2 inches below the surface, but probably rise nearer the surface at night, when most of the feeding occurs. Though generally present throughout the whole crop, they are often numerous in patches, as many as 40 to the square foot being recorded. By the middle of October the larvae construct cells 4–6 inches below the surface, in which they eventually pupate. The duration of the pupal stage is about 6 weeks. A description of all stages of the beetle is given.

No satisfactory method of control has yet been discovered, cultivation of the soil having been proved practically valueless and crop rotation being impracticable. Various chemicals tried as soil fumigants proved unsatisfactory for large scale control, though in small areas, calcium cyanide dust applied heavily by hand at the rate of 30 oz. to 100 sq. ft. secured a 70 per cent. kill. The fact that the beetles do not feed above ground, and the limited time spent there, render the use of light traps and control with arsenicals out of the question. Of a number of substances tested as attractants for the beetles, guaicol proved the most promising, and further tests will be made with it. Natural enemies of *A. tetricus* include birds, ants and the Asilid, *Blepharotes coriarius*, Wied.

FROGGATT (J. L.). **Baiting for Banana Weevil Borer Control.**—*Queensland Agric. J.*, xxix, pt. 4, pp. 282–283. Brisbane, 1st April, 1928.

A brief review is given of the bionomics of the banana weevil borer [*Cosmopolites sordidus*, Germ.], and of the various methods of baiting. In young plantations from which the first bunch has not been cut, old corms are used as bait. These are cut into four or more pieces, which are dusted with Paris green (1 pt. to 6 pts. flour) and placed with the cut surface downwards on the ground close to the stool. They are then covered with a thick layer of dry trash to prevent them drying up too rapidly and to render the immediate vicinity of the bait darker and therefore more attractive to the weevil. In older plantations, after the bunch is cut, the stem should be cut off close to the ground and a slice, a cone-shaped piece or a V-shaped piece cut from the butt that is left. The butt and the piece removed are dusted with Paris green and the piece is then replaced with a small stick or stone placed beneath it to prevent it fitting too tightly. In each case the butt should be covered with trash. The V-shaped method has the advantage of having a direct opening with the soil on either side, thus enabling the beetles to gain access to the poisoned surfaces without coming out of the soil and climbing over the bulb.

DAVEY (H. W.). **Control of Orchard Insect Pests.**—*J. Dept. Agric. Victoria*, xxvi, pt. 4, pp. 230–233. Melbourne, April 1928.

A brief account is given of the control measures used against the more common pests of orchards in Victoria, only the popular names of the insects being given.

NORTHCROFT (E. F.). **The Blackberry Pest.**—*N.Z. J. Agric.*, xxxvi, no. 4, pp. 261–275. Wellington, 20th April 1928.

This section of a paper on the biology, distribution and control of blackberry in New Zealand deals with the possibility of its control by means of insects and fungi and gives the results of local work and an account of an investigation undertaken in 1924–25 to ascertain its natural enemies in other parts of the world.

The natural enemies already present in New Zealand are discussed, and the results of a survey of the blackberry areas in the North Island and parts of the South Island are given, the insects and fungi being considered according to the particular topographical conditions under which they attack the plant. None of these was found to be harmful to any great extent. The conditions restricting the importation of insects into New Zealand for the control of blackberry are given in detail, together with an annotated list of the insects that Dr. Tillyard suggests should be imported and studied [*R.A.E.*, A, xv, 318]. The methods used for testing insects introduced for the control of noxious weeds are described.

Early in 1927 78 pupae of *Thyatira batis*, L., were received in New Zealand, and 52 moths emerged. These gave rise to 340 larvae, which were reduced to 64 by heavy mortality and starvation tests. The tests showed that they also fed on raspberry and loganberry, but not on strawberry, and that they preferred blackberry to either. The other insects imported at this time were *Agrilus ruficollis*, F., and *Pennisetia* (*Bembecia*) *marginata*, Harr., which were received from America, and *Coraebus rubi*, L., but none of them survived. The most promising insect is *C. rubi*, the larvae of which bore down from the crown into the root and return to the crown when fully fed to pupate in a large cavity made within the tissues. This Buprestid attacks *Rosa indica*, which is used in Europe as a stock, but exhaustive enquiries have shown that it is seldom made use of in New Zealand. The stocks used in New Zealand will also be tested.

From the number of insects attacking blackberry and the variety of their feeding habits it seems that the biological method of control is promising. It is not probable that any insect will be found that attacks blackberry exclusively, since all insects that feed on blackberry also feed on raspberry. On the other hand the range of food-plants in the native habitat appears to be very limited, being confined almost entirely to the genus *Rubus*. If an insect or insects, or a combination of an insect and a fungus, could be found that would eradicate blackberry at the expense of raspberry, it is suggested that the latter should be sacrificed, for it is probable that the losses caused by the blackberry are far greater than the value of the entire raspberry crop. Moreover the insects attacking blackberry and raspberry appear to be comparatively easy to control—in the case of those forming galls by removing the injured canes, and in other cases by spraying. It is pointed out that, unfortunately, no insect has yet been found that attacks the flowers or young fruit.

Leplae (E.). **Le scolyte du café** (*Stephanoderes*).—*Agric. Elevage Congo belge*, ii, no. 11, pp. 121–123, 7 figs. Brussels, 2nd June 1928.

An account is given of the bionomics of *Stephanoderes hampei*, Ferr. (*coffeae*, Hag.) and the measures recommended for its control. This Scolytid is very abundant in the coffee plantations of the equatorial zone of the Belgian Congo, especially in the neighbourhood of Stanleyville.

Leplae (E.). **Le ver rose du coton dans la région du lac Kivu.**—*Agric. Elevage Congo belge*, ii, no. 10, pp. 109–111, 3 figs. Brussels, 19th May 1928.

In view of the recent discovery of *Platyedra gossypiella*, Saund. (pink bollworm) in the Belgian Congo [*R.A.E.*, A, xvi, 303], a short account is given of its life-history and of the cultural and other measures recommended to prevent its spread. The Government intends to withdraw all sales licences from factories that fail to carry out the disinfection of cotton seed by hot air by means of the officially approved apparatus.

Ripley (L. B.). **Susceptibility of Legumes to Aphid Attack.**—*S. Afr. J. Nat. Hist.*, vi, no. 3, pp. 188–189. Pretoria, April 1928.

A table is given showing the relative susceptibility of 31 different leguminous plants to the attack of *Macrosiphum* (*Illinoia*) *pisi*, Kalt., from an examination of experimental plots at Cedara in September 1926 after a dry and unusually cold winter season. Plants of the genus *Melilotus* are apparently highly susceptible. *Trifolium alexandrinum*, which normally suffers moderate damage, was practically free from Aphids when *Melilotus* accidentally grew entangled with it, while the latter was nearly killed by them. Although *Vicia ervilia* is highly susceptible, 5 other species of *Vicia*, including broad beans (*V. faba*), were only slightly attacked. A similar difference is seen in the case of the South African lentil (*Lathyrus sativa*), which appears immune, and the Californian *L. tingitanus*, which suffered severely. Both actual infestation and relative susceptibility are possibly subject to variation under different seasonal and climatic conditions.

Jack (R. W.). **The Lesser Tobacco Wireworms.**—*Rhodesia Agric. J.*, xxv, no. 4, pp. 465–469, 1 pl.; also as *Bull. Minist. Agric.*, no. 689, 7 pp., 1 pl. Salisbury, Rhodesia, April 1928.

The most injurious of the so-called wireworms (Tenebrionids) in Southern Rhodesia belong to the genus *Trachynotus*, of which *T. geniculatus*, Haag., is the common species. During the dry season the larvae feed on the underground parts of plants and possibly on dry vegetable matter; they may also be carnivorous to some extent. During the early part of the rains, they feed on green plant tissue. In tobacco the underground stems are eaten, causing the plants to wilt; similar injury occurs on cotton, while in the case of maize the germinating seed is attacked. The time of the appearance of the adults varies from year to year and probably with the locality. Eggs are laid shortly after the emergence of the beetles from the soil; in Salisbury they were obtained in large numbers at the end of April and in the first half of May. The eggs are laid in the soil, usually at a depth of about ¼ inch, or under some shelter such as dead leaves, grass, etc., under which the adults congregate. The larvae hatch in a month and grow fairly rapidly during the winter, continuing their development during the wet season and pupating in March in the soil. The pupal stage lasts about 3 weeks, the life-cycle thus occupying a year, but some of the grubs may not produce adults until the second year. Remedial measures should be directed against the adults. As they have a tendency to leave land that is smooth and bare, new land may be broken during the previous wet season ; if thoroughly cleaned and bare by April, it should be less liable to contain wireworms when planted next season. The same procedure may possibly be followed in some old lands. The beetles may be concentrated by distributing small heaps of grass or bush about the land and under these they may be destroyed with wire flails, etc. Baits, however, require less labour ; several formulae have given good results, the cheapest consisting of maize bran moistened with a solution of 1 lb. sodium arsenite in 20–30 gals. water. This may be applied at the rate of 1 tablespoonful to each 10 sq. yards, the bait being covered with a small quantity of foliage, which will keep it moist and attract the beetles. When the bait has dried, it may be moistened again.

Some farmers have obtained better results with Paris green, but this is more expensive. If bran is omitted, the bait may be made of chopped green stuff dipped in a solution consisting of 1 lb. sodium arsenite, 8 lb. cheap sugar or 1 gal. molasses and 10 gals. water. This bait may be broadcast or applied like the bran bait.

George (L.). **Sur la biologie de l'*Apanteles glomeratus* L.**—*Bull. Soc. Hist. nat. Afr. N.*, xix, no. 2, pp. 104–112, 11 refs. Algiers, 15th February 1928.

Further observations have been made on the biology of *Apanteles glomeratus*, L., in Algeria [*R.A.E.*, A, xv, 554]. Experiments showed that the antennae, which contain the olfactory organs, are used by the males to seek out the females and by the females to find suitable hosts for oviposition. In one case three larvae of *A. glomeratus* emerged from a caterpillar of *Pieris brassicae*, L., that subsequently pupated and produced a butterfly with damaged wings ; this is the only time that the author has observed a parasitised caterpillar to survive. Further studies on the emergence of the parasite in 1926 and 1927 showed that in addition to the diapause in the winter generation [*loc. cit.*] there are individuals exhibiting retarded development in the other three generations, the additional time spent in the cocoon varying from 13 to 77 days. This, together with the fact that *A. glomeratus* is polyphagous, increases its efficiency, since it is thus able to persist in the absence of its preferred host, *Pieris brassicae*. During the summer the host larvae develop more rapidly, and the maximum attack by the parasite, which can only infest young larvae, is consequently earlier than in the winter or spring. Temperature also accelerates the development of the parasite. The influence of light on pairing and parthenogenesis is discussed.

Mellor (J. E. M.). **The Oriental Hornet (*Vespa orientalis*, Fab.).**—*Leafl. Plant. Prot. Sect. Minist. Agric. Egypt*, no. 1, 6 pp., 3 figs. Cairo, 1928.

This popular account of *Vespa orientalis*, F. (oriental hornet), a serious pest of Egyptian apiaries, includes a brief description and a record of observations made at the government apiary at Giza in 1926 and 1927. Various methods of destruction are indicated, and instructions are given for making a trap. The hornet is best attacked in winter, when only the queens, which hibernate in holes and crevices in walls, are alive.

Lord (L.). **The Effect of Attack by Paddy Moth and Paddy Weevil on the Germination of Rice Seeds.**—*Trop. Agriculturist*, lxx, no. 4, pp. 214–215. Peradeniya, April 1928.

In the course of a series of notes on rice culture in Ceylon, it is stated that rice seed stored in gunny bags or in anything except insect-proof receptacles is liable to become infested with *Sitotroga cerealella*, Ol. (paddy moth) and *Calandra oryzae*, L. (paddy weevil), and experiments have been carried out to determine the effect of these pests on the germination of the seed. In a little over four months the germination of seed exposed to the attack of these insects was reduced by 23·25 per cent., while the normal reduction in seed protected from them was only 7·75 per cent. The greatest damage invariably occurred in the centre of the bag. Where large quantities of different varieties of seed are stored, wooden or galvanised iron receptacles should be capable of being rendered air-tight to allow of fumigation with carbon bisulphide. Fumigation should be done soon after the seed is placed in the receptacle and, if necessary, should be repeated. If seed is stored in gunny bags, provision should be made for one air-tight chamber where all the seed rice can be fumigated in successive lots at least once, the first time immediately after threshing. Periodical exposure to the sun should then keep the damage within reasonable limits. In districts where the seed from one crop is sown for the succeeding season, the problem of storage does not arise. It has been found that naphthalene in an enclosed receptacle exerts a definitely deterrent and a possibly toxic effect on *S. cerealella* ; experiments are now in progress to ascertain if this substance has any detrimental effect on the viability of the seed.

Pinto (M. P. D.). **The two Weevil Pests of Plantains** (*Musa sapientum*, **L.**). *Cosmopolites sordidus*, **Germ. and** *Odoiporus longicollis*, **Oliv.**—*Trop. Agriculturist*, lxx, no. 4, pp. 216–224, 1 pl., 8 refs. Peradeniya, April 1928.

Serious damage is done to bananas (*Musa sapientum*) in Ceylon by the grubs of *Cosmopolites sordidus*, Germ., and *Odoiporus longicollis*, Oliv., which tunnel in the rhizomes and stems respectively. The life-histories of both weevils have been worked out in the laboratory in Ceylon and observations made in the field whenever possible. Their various stages are described. *C. sordidus*, the bionomics of which are briefly discussed, is found throughout the year, several generations occurring. Under laboratory conditions the whole life-cycle from egg to adult occupies 5 or 6 weeks, the eggs requiring 6–7 days, larvae 21–28 days and pupae 6–9 days.

O. longicollis is only known to occur in north-east India, Burma and Ceylon. The adults may be found in stumps or stems of banana left on the ground after removal of the bunches or under the loose, dry sheaths hanging from the stem or round its base. The life-cycle in the laboratory occupies 26–30 days, the egg, larval, prepupal and pupal periods lasting 3–4, 11–18, 3–6 and 7–10 days respectively. The remedial measures are similar for both species and include the choice of a healthy site and planting material, good sanitation in the plantations, rotation of crops within three years, total destruction of badly infested plants and the use of sliced stems and rhizomes as traps.

Light (S. S.). **Weevils injurious to Tea.**—*Tea Quarterly*, i, pt. 2, pp. 45–47, 1 fig. Nuwara Eliya, Ceylon, May 1928.

Astycus apicatus, Mshl., and *A. immunis*, Wlk., are reported as attacking two-year-old tea stumps, feeding chiefly on the buds and young shoots. Although large numbers had already been collected by hand when the examination was made, 2 to 4 weevils were found on each plant, many of which were severely defoliated. Owing, however, to the prompt measures taken and the fact that the weevils were dispersed by rain a few days later, no great loss was sustained. It is uncertain where the infestation originated, since no trace of weevils was found on the plants in the jungle surrounding the infested area. Experiments were carried out with the object of discovering the natural food-plants of the weevils ; eggs were laid in clusters, on or in the soil, but the larvae that emerged could not be induced to feed on any of the substances submitted to them, which included tea rootlets and parts of older roots. It is, therefore, thought probable that the larvae live in the soil and feed very little, if at all, on the roots of tea. The only methods of control at present recommended are hand collection and dusting with copper arsenite mixed with three times the quantity of powdered slaked lime following on a preliminary spraying with water, dusting being only advisable for young plants or bushes just coming out of pruning.

A list is given of other weevils recorded as having attacked tea in Ceylon and India, with notes on their alternative food-plants.

Kuwana (I.). **Aleyrodidae or White Flies Attacking Citrus Fruits in Japan.**—*Sci. Bull. Minist. Agric. & For. Japan*, no. 1, pp. 41–78, 1 pl., 35 refs. Tokyo, March 1928.

This paper deals with the six species of whitefly that attack *Citrus* in Japan : *Aleurocanthus spiniferus*, Quaint. (orange spiny whitefly), *Aleurolobus marlatti*, Quaint., *Tetraleurodes aucubae*, Kuw., *Bemisia giffardi*, Kotinsky, *B. myricae*, Kuw. (Japanese-bayberry whitefly), and *Dialeurodes citri*, Ashm. (common whitefly). Notes are given on the life-history, habits, food-plants and natural enemies of these species, and in most cases the various stages are described. The whiteflies extract large quantities of sap from the leaves of the plant and excrete honey-dew on which a black sooty mould develops. The weakened trees produce small crops, and the ripening and colouring of fruits are retarded. Secondary injury may result from the increase of Coccids, particularly mealybugs, that find shelter under the mould.

An annotated list is given of the eighteen species of whitefly that attack *Citrus* in other parts of the world.

Parker (T.). **The Use of Tetrachlorethane for Commercial Glasshouse Fumigation.**—*Ann. Appl. Biol.*, xv, no. 2, pp. 251–257, 6 refs. Cambridge, May 1928.

Experiments were carried out between 1920 and 1926 to ascertain the best method for the application of tetrachlorethane as a control for *Trialeurodes vaporariorum*, Westw. (greenhouse whitefly) on tomatos under commercial conditions and the lowest concentration that will effectively control pests on glasshouse plants. The tetrachlorethane, in quantities varying from 1½ to 20 fl. oz. to 100 cu. ft., was applied in the following ways: by sprinkling along the paths of the house; by pouring on to heaps of coke contained in seed boxes placed at intervals along the paths; by vaporising by means of lamps; by impregnated sacks hung at intervals from the wires of the house; and by atomising with a mist sprayer. All fumigations were begun after 6 p.m. The best results were obtained with the use of impregnated sacks. It was found that adults may be killed by using 2½ to 5 fl. oz. to 1,000 cu. ft. if the temperature is maintained at 65 to 70° F. over a period of 12 hours and the glasshouse is reasonably air-tight, and it is thought that three fumigations at 5 fl. oz. at intervals of 10 days should be sufficient to kill the immature stages and keep an ordinary infestation in check.

In another series of experiments it was found that 100 per cent. of *Tetranychus telarius*, L., 80–90 per cent. of two species of Aphids and over 90 per cent. of *Pseudococcus adonidum*, L. (*Dactylopius longispinus*, Targ.) survived fumigation with a concentration of 20 fl. oz. tetrachlorethane to 1,000 cu. ft. This confirms the view that tetrachlorethane is not a tissue poison, but has some action on the waxy covering of *Trialeurodes vaporariorum*. Its effect on 55 different species of plants is indicated in a table.

Tetrachlorethane should be tested before use if it has been held in stock for any length of time, owing to the possibility of decomposition during storage with the formation of free hydrochloric acid.

TAYLOR (T. H.) & THOMPSON (H. W.). **A Garden Chafer Attack.**—*Ann. Appl. Biol.*, xv, no. 2, pp. 258–262, 1 pl., 2 figs. Cambridge, May 1928.

The larvae of *Phyllopertha horticola*, L. (garden chafer) caused severe damage to grass-land on a farm in Yorkshire in 1919, the hay crop having become lighter and poorer in quality over a period of several years, while the turf was in such bad condition that cattle would not graze on it. The attack was less severe in the spring of 1920, and the turf began to develop new roots and to recover; it is therefore thought that meadows subjected to only one season's attack would not suffer any lasting harm. Pupation took place at a depth of about 4 ins. in the soil during May, and adults were observed on 8th June and became very numerous during the next two or three weeks. The adults attacked broad-leaved plants, notably buttercup, *Rumex* and clover, often completely destroying the flowers, and were particularly attracted to bracken, especially when the fronds were unfolding, causing an injury very similar to the discolouration due to late frosts. Simple direct methods of control, such as hand collection, are made easy by the short duration of the adult stage, the insect's comparative inertness, its habit of dropping when disturbed, and the fact that it will restrict itself to a small area, such as an isolated clump of bracken. Shaking the beetles on to a wide-lipped scoop and sliding them into a box attached to the narrow end was found to be the most satisfactory method of collecting them from the bracken. Very little trace of attack was found in the year following the adoption of such control methods, and from subsequent inspections, repeated up till 1927, the pest appeared to have been exterminated.

DAVIES (W. M.). **The Bionomics of *Apion ulicis*, Forst. (Gorse Weevil), with Special Reference to its Rôle in the Control of *Ulex europaeus* in New Zealand.**—*Ann. Appl. Biol.*, xv, no. 2, pp. 263–286, 3 pls., 3 figs., 21 refs. Cambridge, May 1928.

A study of *Apion ulicis*, Forst., has been made with reference to its proposed introduction into New Zealand for the control of gorse (*Ulex europaeus*) [*R.A.E.*, A, xv, 318]. The synonomy of this weevil is discussed, and a detailed description of all the stages is given. It hibernates in the adult stage, generally at points where buds and spines join the branches, and very little food is consumed before February. Mating was observed between 26th March and the end of May. Oviposition occurred from 30 to 42 days later, the first instance being noticed on 11th May, and continued until early August. The weevils prefer the young pods, boring a hole into them with the rostrum before laying the egg; oviposition ceases where the pods become hard and black. The eggs are laid in batches of 6 to 8, more than one batch being occasionally found in the pod, which may contain from 1 to 23 eggs. The larvae hatch in from 22 to 30 days and feed on or in the seeds. Pupation takes place in a cocoon in the pod during the latter part of July and in August, and lasts from 8 to 12 days in the laboratory, pupae having, however, been found in the field as late as 9th October. Adults, from 1 to 16 of which may be found in a pod, emerge when the pod cracks and are quite active on gorse on sunny days, but become sluggish at the first appearance of frost. The damage to gorse pods appears to be negligible, but it has been found that three larvae can destroy the entire contents of a normal pod, while in a survey of 62 districts of Great Britain 92 per cent. of the pods examined were infested.

Various tests were made to ascertain whether *A. ulicis* would attack economic plants, and it was found that only leguminous plants need be considered, since no eggs laid outside pods were capable of developing. Oviposition did not take place in the pods of any of the plants tested except *Ulex europaeus*, while larvae introduced into them failed to develop.

Spintherus leguminum, Ratz., a Hymenopterous parasite of *A. ulicis*, occurred in practically every locality, but parasitism was low, the average being 4 per cent.

JAMES (H. C.). **On the Life-histories and economic Status of certain Cynipid Parasites of Dipterous Larvae, with Descriptions of some new Larval Forms.**—*Ann. Appl. Biol.*, xv, no. 2, pp. 287–316, 12 figs., 22 refs. Cambridge, May 1928.

A description is given of the adult and larval stages of *Cothonaspis rapae*, Westw., a Cynipid parasite of *Phorbia* (*Hylemyia*) *brassicae*, Bch., and of three other species of Cynipids that develop in saprophagous larvae. *C. rapae* was reared from the larvae of *P. brassicae* on young cabbage plants enclosed in muslin-topped glass cylinders, individuals then being transferred to glass breeding-tubes containing pieces of cabbage root loosely embedded in the soil. Pairing was not observed in captivity, although oviposition took place; both sexes live for a considerable time, 14 to 18 days being the normal period for females, while one survived for a month. *C. rapae* exhibits negative phototropism, and oviposition, which took place only in larvae of the first and second instars, did not occur unless the roots of the cabbage plant were loosely embedded in the soil; more than two eggs have never been observed in one larva, and where two are present, one generally dies. Oviposition begins 2 days after emergence and continues for about 16 days, the eggs hatching in about 6 days ; the total life-cycle lasted from 70 to 111 days with an average of 92, the larval stage, in which hibernation takes place, lasting on an average 55 days. Two generations were observed during the season, the first emerging during May and the second in late August and September. Parasitised larvae of *P. brassicae* develop much more slowly than healthy ones and show a tendency to premature pupation if removed from their food material. The rate of parasitism of the total number of host larvae and puparia examined near Cambridge was 25 per cent. ; the Staphylinid beetle, *Aleochara bilineata*, Gyll., was responsible for an almost equal rate of parasitism in the material examined.

Experiments were made to induce *C. rapae* to oviposit in saprophagous maggots, after the latter had been well washed and smeared with the expressed juice of cabbage roots, but owing, probably, to the fact that it was impossible to reproduce the conditions necessary for oviposition, eggs were in no case found on the subsequent dissection of the larvae.

FRYER (J. C. F.). **Legislation in England against Diseases and Pests of Plants.**—*Ann. Appl. Biol.*, xv, no. 2, pp. 318–328. Cambridge, May 1928.

This Presidential address at the Annual General Meeting of the Association of Economic Biologists consists of a review of the development of legislation regarding insect and other pests in England. As regards the introduction of pests from abroad, it is thought that in spite of all that can be done pests will continue to penetrate new areas until they have extended throughout their potential geographical range.

FRANSSEN (C. J. H.). **De biologie en systematiek der Nederlandsche "zwarte bladluizen."** [[The Biology and Classification of the Dutch "black Aphids."]—*Natuurhist. Maandblad*, xvii, nos. 4–6, pp. 58–60, 70–76, 80–87, 5 figs., 8 refs. Maastricht, April–June 1928.

The "black Aphids" in Holland are here divided into five groups. The group to which *Aphis fabae* belongs, has been already dealt with at length [*R.A.E.*, A, xv, 464 ; xvi, 200.] A key is given to this and the other groups, *viz.*, the insects allied to *A. acetosae*, *A. genistae*, *A. viciae* and *A. laburni*, with notes on their biology, and the characters common to the species in each are enumerated.

KALANDADZE (L.). **Beobachtungen über den blauen Schinkenkäfer** (*Necrobia rufipes* **de Geer**). [Observations on the Ham Beetle, *N. rufipes*.]—*Mitt. Ges. Vorratsschutz*, iv, no. 3, pp. 33–35, 1 fig. Berlin, May 1928.

Necrobia rufipes, DeG., is not very injurious in the adult stage. The larvae, which are serious pests of a great variety of products of animal and vegetable origin, can fast for over two months. They did not attack larvae of *Dermestes vulpinus*, F., confined with them, nor was cannibalism observed. The statement that they develop better when fed on larvae of *Piophila casei*, L. [*R.A.E.*, A, xiii, 508] was confirmed. The larvae died when Chinese dried egg yolk was the only food, while the adult beetles seemed to thrive on it, but though pairing occurred, no eggs were laid.

REH (L.). **Eine Mottenraupe als gefährlicher Bücher-Schädling.** [A Moth Larva highly injurious to Books.]—*Mitt. Ges. Vorratsschutz*, iv, no. 3, pp. 35–36, 1 fig. Berlin, May 1928.

The larvae of *Tinea fuscipunctella*, Hw., have been observed in Hamburg destroying the bindings, mostly pigskin, of a number of old books, the card stiffening of the backs being also eaten. This moth occurs in Europe and also in India, where it is the common clothes moth. The larvae live chiefly on animal material such as wool and feathers, being very common in birds' nests, but also infest dried fruits and peas, and occur in the field between the seeds of grass. In Germany there are two generations a year, the adults appearing in May–June and August–September, and the larvae in July–August and from September or October to the following April. In the case mentioned, the books were fumigated for 48 hours with hydrocyanic acid gas, 2 volumes per cent.

CORNU (C.). **Ueber die insektentötende Wirkung der Speichelwurz.** [On the insecticidal Action of *Anacyclus pyrethrum*.]—*Z. angew. Chemie*, xl, 1927, p. 1581. (Abstract in *Centralbl. Bakt.*, (2) lxxiv, no. 15–23, pp. 473–474. Jena, 21st May 1928.)

Staudinger and Ruzicka have found that pyrethrine, an ester very sensitive to alkalies, is the active principle in the roots of the so-called German pyrethrum [*Anacyclus pyrethrum*]. Its action resembles that of strychnine or even more that of veratrine ; it is about 10–15 times as active as nicotine, and it has the advantage of being quite harmless to warm-blooded animals. As its synthetic production has not yet been possible [*cf. R.A.E.*, A, xvi, 11], the planting of *A. pyrethrum* on an extended scale is to be recommended. The plant is very hardy and thrives on poor soil.

GESCHER (C.). **Zur Reblauskunde und Reblausbekämpfung.** [A Contribution to the Knowledge and Control of *Phylloxera*.]—*Die kranke Pflanze*, v, no. 4, pp. 60–62. Dresden, April 1928.

In a previous paper [*R.A.E.*, A, xvi, 179] it was suggested that for the maintenance of a colony of *Phylloxera* it is eventually essential for it to be regenerated by migration to the roots of forms that are the result of sexual reproduction on the aerial parts of the vine. Since then, the significant discovery has been made of the aerial forms in Germany, where only the root forms have been previously known [A, xvi, 373].

In the vine-growing regions of northern Germany, there is, in warm summers, often a great reduction of the root infestation by migration, while the winter eggs usually perish. It is, therefore, particularly necessary for the colony to be maintained by a regular annual increment (always seen in the south on gall-bearing vines) of young root forms from the aerial parts of the plant. Everything points to some of the flying individuals being sexual and producing eggs that hatch in the same summer or autumn and the progeny of which enter the ground, so that there is a summer egg as well as a winter one. Furthermore, Topi has found that aerial forms can live on vines that do not bear galls. It therefore appears that in the northern climate of Germany aerial forms can occur on German grape vines. These facts are of the utmost importance, for it should not be difficult to sever the essential connexion between the aerial and underground forms.

PAPERS NOTICED BY TITLE ONLY.

[ZHIKHAREV (P. I.).] **Жихарев (П. І.). Contribution to the Knowledge of the Buprestids of Greece.** [19 Species.] [*In German.*] —*Trav. Mus. zool. Ukraine,* no. 5, pp. 159–162. Kiev, 1928.

[IVANOV (S. P.).] **Иванов (С. П.). List of Homoptera-Auchenorrhyncha of the Kiev Government.** [226 Species.] [*In German.*]—*Trav. Mus. zool. Ukraine,* no. 5, pp. 185–200, 3 refs. Kiev, 1928.

[SAKHAROV (N. L.).] **Сахаров (Н.). Lepidoptera injurious to Forest and Orchard Trees.** [*In Russian.*]—*Izv. Saratovsk. Gosud. Inst. Sel. Khoz.* [*Bull. Saratov State Inst. Agric.*], 1927, pts. 3 & 4, pp. 1–11, 5–49, 10 figs., 53 refs. Saratov, 1928. [*Cf. R.A.E.*, A, xiii, 473.]

[ZAÏTZEV (F. A.).] **Зайцев (Ф. А.). A Review of the Melolonthids in Caucasia in Connection with their Distribution in that Region.** [*In Russian.*]—*Izvest. Tiflissk. Gosud. Politekhnichesk. Inst.*, pt. 3, pp. 373–397, 1 ref. [Tiflis, 1928.] (With a Summary in German.)

[SHOROKHOV (S. I.).] **Шорохов (С. И.). The Bark-beetle Fauna of the Moscow Government.** [List of 54 Species.] [*In Russian.*]—*Défense des Plantes,* iv, no. 6 (December 1927), pp. 958–962. Leningrad, 1928.

[SPESIVTZEV (P.).] **Спесивцев (П.). On the geographical Distribution of Bark-beetles.** [Corrections and Additions.] [*In Russian.*]—*Défense des Plantes,* iv, no. 6 (December 1927), p. 993. Leningrad, 1928. [*Cf. R.A.E.*, A, xiv, 56.]

[ESTERBERG (L. K.).] **Эстерберг (Л. К.). The Bark-beetles of the Vladimir Government.** [*In Russian.*]—*Défense des Plantes,* v, no. 1, pp. 47–49. Leningrad, 1928.

[STAKHANOV (V. S.).] **Стаханов (В. С.). A Study of the Food of the Jay,** *Garrulus glandarius* **L.** [*In Russian.*]—*Défense des Plantes,* v, no. 1, pp. 19–23, 3 refs. Leningrad, 1928.

FREIBERGER (W.). **Zur Vogelschutzfrage, insbesondere zur wissenschaftlichen Begründung des wirtschaftlichen Vogelschutzes.** [A Contribution to the Question of Bird Protection, and especially to the scientific Foundation of economic Bird Protection.]—*Allgem. Forst- u. Jagdzeitung,* cii, 1926, pp. 425–430 ; ciii, 1927, pp. 19–30, 49–63 & 92–115. (Abstract in *Z. angew. Ent.*, xiii, no. 2, pp. 403–404. Berlin, December 1927.)

FREIBERGER (W.). **Die Einrichtung des planmässigen Vogelschutzes.** [The Systematic Organisation of Bird Protection.]—*Allgem. Forst- u. Jagdzeitung,* ciii, 1927, pp. 232–246. (Abstract in *Z. angew. Ent.*, xiii, no. 2, pp. 404–405. Berlin, December 1927.)

Thomsen (M.). **Studien über die Parthenogenese bei einigen Cocciden und Aleurodiden.** [Studies on Parthenogenesis in some Coccids and Aleurodids, including a Description of the Male of *Coccus* (*Lecanium*) *hesperidum.*]—*Z. Zellforsch. u. mikrosk. Anat.*, 1927, no. 1–2, pp. 1–116, 4 figs., 5 pls. (Abstract in *Z. angew. Ent.*, xiii, no. 2, pp. 396–397. Berlin, December 1927.)

Hartig (F. G.). **Ueber einige praktische Sammelmethoden für biozönotische Forschungen in der Lepidopterologie.** [On some practical Methods of Collection for Investigations on Biocoenosis in Lepidoptera.]—*Anz. Schädlingsk.*, iv, no. 5, pp. 67–71, 2 figs. Berlin, 15th May 1928.

Paillot (A.). **Sur le cycle évolutif de** *Nosema bombycis*, **parasite de la pébrine du ver a soie** [*Bombyx mori*].—*C.R. Soc. Biol.*, xcix, no. 19, pp. 81–83, 16 figs. Paris, 8th June 1928.

Sato (R.). **Ueber bakterielle Krankheiten der Seidenraupen** (*Bombyx mori*, **L.**) **insbesondere über Septikämie.** [On bacterial Diseases of Silkworms, *B. mori*, and particularly on Septicaemia.]—*Centralbl. Bakt.*, (1) Orig., cvii, no. 4–5, pp. 234–278, 38 refs. Jena, 14th May 1928.

Kleine (—). **Neuere Beobachtungen uber** *Oscinis frit* **und Thrips an Hafer.** [Recent Observations on *Oscinella frit* and Thrips on Oats.]—*Pflanzenb.*, iv, 1927–1928, p. 81. (Abstract in *Centralbl. Bakt.*, (2) lxxiv, no. 15–23, p. 478. Jena, 21st May 1928.) [*Cf. R.A.E.*, A, xiii, 203 ; xiv, 110, 382 ; xv, 168, 383, 617.]

Ladell (W. R. S.). **Some injurious Insects in Siam.** [List of 68 Species with Food-plants.]—*J. Siam Soc.*, Nat. Hist. Suppmt., vii, no. 2, pp. 101–105, 1 ref. Bangkok, October 1927.

Eguchi (M.). **A List of the Insect Pests of Sugar-beet in Korea** [42 Species]. [*In Japanese.*]—*Rep. Agric. Expt. Sta. Korea*, iii, no. 4, pp. 270–282. Suigen, Korea, August 1928.

Kuwana (I.). **The Diaspine Coccidae of Japan. V. Genera** *Chionaspis*, *Tsukushiaspis* [gen. n.], *Leucaspis* **and** *Nikkoaspis* [gen. n.].—*Sci. Bull. Minist. Agric. & For. Japan*, no. 1, pp. 1–39, 9 pls. Tokyo, March 1928.

Ferris (G. F.). **Observations on the Chermidae** [Psyllidae] **(Hemiptera : Homoptera). Part iv.**—*Canad. Ent.*, lx, no. 5, pp. 109–117, 4 figs., 2 refs. Orillia, Ont., May 1928.

Tissot (A. N.). **A new Aphid from Poison Ivy** (*Rhus radicans*, **L.**) [in Ohio], *Carolinaia rhois*, **sp.n.**—*Florida Ent.*, xii, no. 1, pp. 1–2, 1 fig. Gainesville, Fla., April 1928.

Sherwood (E. C.). **Control of the Mexican Bean Beetle** [*Epilachna corrupta*, Muls.].—*Circ. W. Virginia Dept. Agric.*, no. 64 ; *Circ. Extens. Div. Coll. Agric. W. Virginia Univ.*, no. 279 ; revised, 8 pp., 6 figs. Charleston, W. Va., & Morgantown, W. Va., March 1928. [*Cf. R.A.E.*, A, xiv, 490.]

Bondar (G.). **O bicho do côco. A biologia do** *Bruchus nucleorum*, **caruncho das sementes das palmeiras.** [The Coconut Grub. The Biology of *Pachymerus nucleorum*, the Weevil of Palm Nuts.]—*Correio agric.*, vi, no. 1, pp. 6–14, 5 figs. Bahia, January 1928. [See *R.A.E.*, A, x, 95.]

Stellwaag (F.). **Epidemiologisch-statistische Untersuchungen für eine rationelle Schädlingsbekämpfung, durchgeführt an den Traubenwicklern.** [Epidemiological-statistical Investigations for the rational Control of Pests carried out with the Vine-moths.]—*Anz. Schadlingsk.*, iv, no. 5, pp. 59–66, 13 figs. Berlin, 15th May 1928.

The Palatine vine-growing region is a particularly favourable area for epidemiological observations on the vine-moths, *Clysia ambiguella*, Hb., and *Polychrosis botrana*, Schiff., owing to the accumulated data available. Serious outbreaks only occur occasionally, the manner of the flight of the moths determining the importance of the outbreak. Previous observations [*R.A.E.*, A, xv, 384 ; xvi, 473] are compared with those made in 1927. In 1927 the spring flight began about 8–14 days later than in 1926 and lasted longer, while the interval between the spring and summer flights was only 4–5 weeks. Furthermore the summer flights in various localities resembled each other in nearly all cases, contrary to what occurred in 1926. Previous experience that the manner of flight depends on the weather conditions at the time has been confirmed.

[Medvedev (S.).] **Медведів (С.). Materialien zur Kenntnis der Geradflügler (Orthoptera) von Askania Nova und deren Gebietes.** [Contribution to the Knowledge of the Orthoptera of the District of Askania Nova.]—*Trav. Mus. zool. Ukraine*, no. 5, pp. 371–409, 1 map. Kiev, 1928.

An account is given of detailed ecological and phenological studies on Orthoptera of the Askania Nova Reserve in the Ukraine.

[Beĭ-Bienko (G. Ya.).] **Бей-Биенко (Г. Я.). A Note on** *Dociostaurus crucigerus brevicollis*, **Ev. (Fam. Acrididae) in Western Siberia. (An Ecological Study.)** [*In Russian.*]—*Izv. Z.-S. Muz.* [*Bull. West-Siberian Mus.*], no 1, reprint, 8 pp., 9 refs. Omsk, 1928.

Dociostaurus crucigerus brevicollis, Ev., is generally distributed in the dry steppes and semi-deserts of the Kirghiz Steppes and Turkestan, but isolated colonies also occur in the steppe-forest zone of Western Siberia, mainly on alkaline soils with scattered vegetation, on overgrazed pastures, etc. Cultivation is likely to increase the areas suitable for this grasshopper, which may then become a pest.

[Ritus-Potapova (T. M.).] **Ритус-Потапова (Т. М.). Some Peculiarities in the Flowering of Apple Trees in Connection with the Biology of** *Anthonomus pomorum*, **L.** [*In Russian.*]—*Défense des Plantes* v, no. 1, pp. 25–31, 5 refs. Leningrad, 1928.

Observations were carried out in the spring of 1925 to ascertain the reaction of different varieties of apple to infestation by *Anthonomus pomorum*, L., and the importance of meteorological factors in the development of the weevil and the blossoming of apple trees. The period of infestation depends on the time the eggs reach maturity in the weevil, which in turn, like the appearance of the apple buds, depends on meteorological conditions. Weevils collected early in April from the bark were found to contain a small quantity of fat-body and undeveloped eggs ; by the middle of the month they had reached the buds and began feeding on them. By this time the ovaries had increased in size, and the eggs had begun to mature. By 20th April pairing was observed, and mature eggs were found in each egg-calyx of the weevil. About 38 per cent. of the hibernating weevils taken under the bark were found to contain 1–5 small larvae of an unidentified parasite. The development of the ovaries was inhibited as a result, reproduction being thus prevented. The first eggs of the weevil were found in the buds of the inflorescence on 29th April, and by 4th May the main period of oviposition was passed, and eggs were found in considerable numbers in the buds of all varieties of apple. The first larva was found on 5th May and isolated pupae ten days later. By the last day of the month the first adults emerged from the buds and began feeding on the leaves, destroying the parenchyma and only leaving the veins.

The development of the flower buds was considerably retarded as compared with the maturation of the female weevils ; their appearance on winter varieties was only about a day behind the summer ones. The summer varieties were all in full bloom within three days of the beginning of the flowering stage, whereas the blossoming of the winter varieties was less uniform. The flower buds appeared about 29th April, almost a fortnight after the weevils had reached maturity. Both are dependent on temperature conditions, the flower buds requiring a higher temperature than the weevils for their development. Eggs are only laid in the exposed flower buds, so that although the weevils had already reached maturity, oviposition was delayed until the flower buds appeared. Although the flower buds appeared late and almost simultaneously on all varieties, the weevils were able to empty their ovaries completely and infest 63 per cent. of the buds. There was no apparent difference in the infestation of summer and winter varieties, but the trees nearest to a forest appeared to be more subject to attack than those nearer the centre of the orchard.

The infestation of summer varieties was reduced by 18–21 per cent. owing to the corollas opening before the larvae had time to stick the petals together ; the larvae thus exposed either fall out of the bud or shrivel up from the sun and dry air. By the same process the infestation of winter varieties was reduced by 3–6 per cent. Some varieties of apple may be considered absolutely immune from *A. pomorum.*

From a review of existing literature, it is evident that the weevil always reaches maturity before the appearance of the flower buds. Neither the early nor late varieties are able to escape infestation, even when there is a considerable interval between the appearance of their flower buds.

[ENGEL'HARDT (V.).] **Энгельгардт (В.). A List of Agricultural Pests of the Far East.** [*In Russian.*]—*Défense des Plantes,* v, no. 1, pp. 50–56. Leningrad, 1928.

This is an annotated list of agricultural pests occurring in the Russian Far East, the insects being arranged under their orders.

[VEBER (Ya. Kh.).] **Вебэр (Я. Х.). A Short Review of the Activities of the Samara Plant Protection Station for the Years 1926 and 1927.** [*In Russian.*]—*Défense des Plantes,* v, no. 1, pp. 68–74, 1 ref. Leningrad, 1928.

The serious outbreak of locusts that began in 1920 gradually increased until 1924 ; after this it decreased until at present only isolated foci remain. Two of these, in which *Calliptamus italicus,* L., and

Chorthippus (*Stauroderus*) *scalaris*, F.W., respectively predominated, were treated with poison baits in 1926. Hardly any locusts appeared in 1927, and no remedial measures were undertaken. *Oedaleus decorus*, Germ., no longer occurs in large numbers.

[YAKUBYUK (A.).] **Якубюк (А.). Further Notes on the Activities of the Bark-beetles of the Genus** *Crypturgus*. [*In Russian.*]—*Défense des Plantes*, v, no. 1, pp. 102–103. Leningrad, 1928.

Further observations confirm previous ones [*R.A.E.*, A, xvi, 39] that *Crypturgus cinereus*, Hbst., attacks other bark-beetles, particularly *Myelophilus minor*, Htg.

[RAEVSKIĬ (V.).] **Раевский (В.).** *Epiblema tripunctana*, **F., as a Pest of Roses in Greenhouses.** [*In Russian.*]—*Défense des Plantes*, v, no. 1, pp. 103–104, 1 ref. Leningrad, 1928.

Epiblema tripunctana, F., is recorded from Omsk, where it occurred in greenhouses on roses and young dog-roses used as stocks. Both sexes of *Apanteles xanthostigma*, Hal., were reared from one larva. This leaf-roller has been recorded in the literature as a pest of apples.

[SILANT'EV (I.).] **Силантьев (И.). Agricultural Pests in Karelia.** [*In Russian.*]—*Défense des Plantes*, v, no. 1, pp. 105–107. Leningrad, 1928.

During a short visit to Karelia the author found *Charaeas graminis*, L., widely distributed and causing considerable damage to pastures. Other pests observed include the frit fly [*Oscinella frit*, L.], and wild clover was considerably injured by *Apion*.

[SOLOV'EV (P.).] **Салаўёў (П.). Experimental Study of injurious Insects.** [*In White Russian.*]—*Sel'sk. i Lyasn. Gaspadarka*, no. 2, pp. 32–35. Minsk, 1927. (Abstract in Russian in *Défense des Plantes*, no. 1, pp. 126–127. Leningrad, April 1928.)

The work in connection with agricultural and forest entomology done at the Zoological Laboratory of the White Russian Agricultural Academy is reviewed. During 1927 *Limothrips denticornis*, Hal., destroyed 10 per cent. of the rye crop in one locality. Other pests recorded are: the Aphid, *Macrosiphum granarium*, Kirby, on rye; *Chlorops taeniopus*, Mg.; *Plutella maculipennis*, Curt. (*cruciferarum*, Zell.) and *Athalia colibri*, Christ (*spinarum*, F.) on root crops (the larva of the latter being described); *Syntomaspis pubescens*, Först., bred from apple seeds; *Melasoma tremulae*, F.; *Agelastica alni*, L.; *Gracilaria syringella*, F.; *Coleophora laricella*, Hb.; *Cossus cossus*, L.; and *Aphis padi*, L., on cherries.

[FEDOROV (S.).] **Федоров (С.). Vine Pests in the Crimea according to Observations made in 1926–27, and their Control.** [*In Russian.*]—*Vest. Vinodel. Ukrainui*, xxix, no. 6, pp. 331–335, 1 ref. Odessa, June 1928.

This is a short account of the damage caused to vines by various insect pests during the season 1926–27, with notes on their control;

several of them were mentioned in the previous year's report [*R.A.E.*, A, xv, 342]. *Agrotis* (*Rhyacia*) *c-nigrum*, L., an unusual pest of vines, occurred along the entire southern coast of the Crimea. Both the larvae and adults of *Labidostomis brevipennis*, Fald., caused considerable injury to vine leaves in the spring, but usually only in neglected vineyards. *Eriophyes vitis*, Nal., was fairly widely distributed. The identity of the vine mealybug usually recorded as *Pseudococcus longispinus*, Targ., in the Crimea is uncertain; it is probably *P. citri*, Risso.

[ENGEL'HARDT (V.).] **Энгельгардт (В.). Pests of Soy-beans in the Russian Far East.** [*In Russian.*]—*Izv. Primorsk. Obl. S.-Kh. Opuitn. Stanz.* [*Bull. Maritime Reg. Agric. Expt. Sta.*], 1927, pt. 8, reprint 4 pp. [Khabarovsk] 1927.

The cultivation of soy-beans (*Glycine hispida*) in the Russian Far East has increased from an area of about 20,000 acres in 1923 to about 55,000 acres in 1926. As it was a comparatively new crop, very little damage was done by insects and other pests. A list is given of the insects attacking this crop, arranged under their orders, and including some that are at present only potential pests.

SCHMITZ (O.). **Ueber die Bekämpfung der schwarzen Blattlaus (*Aphis papaveris*) auf Rübensamen.** [The Control of the Black Aphid, *A. papaveris*, on Seed-Beet.]—*Nachr. Schädlingsbekämpf.*, iii, no. 1, pp. 12–14. Leverkusen, April 1928.

The black bean aphis, *A. papaveris*, F., infests beet grown for seed in Brandenburg. The shoots of a few plants at the edges of the field are first attacked and, with the appearance of the winged forms, infestation spreads to the whole field. In dry years the plants may be killed, and dry weather seems to favour this Aphid. For many years collection of the early-infested shoots has been successful, but it is costly if the initial infestation is extensive. A proprietary spray is described as giving fairly good results.

MLADINOW (T.). *Otiorrhynchus polycoccus*, **Gyll., ein neuer Rebenschädling in Dalmatien.** [*O. polycoccus*, a new Vine Pest in Dalmatia.]—*Nachr. Schädlingsbekämpf.*, iii, no. 1, pp. 14–20, 2 figs. Leverkusen, April 1928.

Otiorrhynchus polycoccus, Gyll., during the past fifty years has sometimes done much injury to vines, the buds, young leaves and young shoots being attacked. Collection of the weevils, the enclosure of the shoots in bags of paper or cloth, and the planting of belts of broad beans are the measures that have been employed. The attractiveness of the beans, however, ceases when the buds begin to swell on the vines. In the spring of 1927 tests were made with adhesive bands and various insecticides. The bands effectively prevented the weevils from ascending the vines, but a proprietary dust proved even more satisfactory, being used both on the vines and on interplanted beans.

VERGUIN (J.) **La mouche des cerises,** *Rhagoletis cerasi,* **L.**—*Rev. Zool. agric.*, xxvii, no. 2, pp. 17–36, 6 figs., 38 refs. Bordeaux, February 1928.

This is a somewhat fuller account of the biology and control of *Rhagoletis cerasi,* L., in France than those already noticed [*R.A.E.* A, xv, 103, 487, 572].

MALENOTTI (E.). **Fumigazioni a zero gradi.** (**Con note su** *Epidiaspis piricola* **Del Guerc.**) [Fumigations at Freezing Point. (With Notes on *E. piricola*.)]—*L'Italia agric.*, no. 4, reprint 11 pp., 9 figs. Piacenza, April 1928.

Epidiaspis piricola, Del G., a serious orchard pest in North Italy, has been effectively combated by fumigation with hydrocyanic acid gas. In winter, at a temperature of 12–15° C. [53·6–59° F.], over 99 per cent. of the scales are killed by the gas produced by 15 gms. of almost pure sodium cyanide per cubic metre of tent space ; at the end of June at 23° C. [73·4° F.] only 5 gms. are necessary. In order to ascertain the effect of fumigation when the ground is frozen and the air-temperature in the neighbourhood of freezing point, ten experiments on 99 severely infested pear trees of various varieties were made in December 1927. In each case fumigation lasted an hour and the temperature varied from –2·5° C. [27·5° F.] to 5° C. [41° F.].

The Sansone Capogrosso method was employed [*R.A.E.*, A, xiv, 569 ; xv, 480]. The conditions of the various tests are discussed, and the particulars are shown in a table. It was proved that a very high percentage of mortality can be obtained even at low temperatures if a high dosage is used, and that the pears are not injured. The gas produces a higher mortality (80–99 per cent.) than the usual sprays. With the semi-permeable tents of the Sansone Capogrosso method, a dose of 30 gms. per cubic metre is required at 2–3° C. [35·6–37·4° F.].

The remainder of the paper consists of notes on the production of spun wax by the male larvae of *E. piricola,* the apterism of the males, and the peculiar shape of their antennae.

WICKENS (G. W.). **Successful Codlin Moth Control in Western Australia.**—*J. Dept. Agric. W. Aust.*, v, no. 1, pp. 52–57. Perth, W.A., March 1928.

Between 1903 and 1928 there have been eleven outbreaks of *Cydia* (*Carpocapsa*) *pomonella,* L. (codling moth) in Western Australia, the earlier ones occurring in city and town properties and all the later ones in orchard districts. It is, however, emphasised that all the outbreaks were due to introductions of the pest from outside the State, 99 per cent. of the area under apples and pears never having been infested. Severe measures of control were adopted in all cases ; in non-commercial areas all the pears and apples were destroyed and the trees cut back so far that practically no fruit was borne during the following season ; in commercial orchards the usual spraying and supplementary measures were applied ; and in each instance the moth did not reappear within 50 miles of the infested area. The methods of control to be adopted in case of attack are given, and an appeal is made against the introduction of apples from the eastern States, if, as is expected, apples become dear during the season owing to the 1928 harvest being exceptionally light.

Newman (L. J.). **Shot-hole Borer** (*Xylion gibbicollis*), **Family Bostrychidae.**—*J. Dept. Agric. W. Aust.*, v, no. 1, pp. 132–136, 3 figs. Perth, W.A., March 1928.

Xylion gibbicollis (shot-hole borer), the distribution of which in Western Australia is discussed, is recorded as attacking vines and was present in all the areas inspected. It has also been bred from *Eucalyptus loxophleba, Acacia microbotrya, A. acuminata* and *Hakea glabella.* The eggs are deposited in small holes in the wood, the larvae boring into it and pupating in the galleries thus made ; there are apparently two generations on vine during the year. The tunnels made by the larvae and adults are either straight or girdle the wood ; the girdling of the cambium tissue only occurs when there is an excess of sap, indicating that the beetles are attracted by dead or unhealthy wood. The girdle was in no case completed, a small section of the cambium always being left intact. Infested vines have a tendency to snap off when tied down into position after pruning, and the quality of the fruit produced is poor ; an indication of attack is the exudation of gum. As a general rule only vines weakened by lack of manure or some similar cause succumb to the attack, the wounds made in healthy ones gradually healing over.

The fact that *X. gibbicollis* has so many alternative food-plants would make its complete eradication extremely difficult ; it is therefore suggested that control is only possible by keeping the vines in good condition. Shallow land that dries out in the summer should not be planted, as manure will not be available to the plants owing to the lack of moisture. Where vines are suffering from drought, water would greatly check the attack of the borer, and nitrogenous fertilisers promote good growth and render the wood of the vine unsuitable for its propagation. A spray of 2½ lb. lead arsenate to 50 gals. lime-sulphur, applied just before the vines begin to break, is recommended as a protective measure against an early summer attack. The borer has been found breeding freely in old vine prunings, and these as well as fruit-tree prunings should be destroyed.

Clouston (D.). **Review of Agricultural Operations in India 1926-27.**—8vo, iv + 158 pp., 7 pls. Calcutta, Govt. India Central Pubn. Br., 1928. Price 3*s.* 6*d.*

Much of the information contained in the brief section of this report devoted to insect pests (pp. 61–62) has already been noticed [*R.A.E.*, A, xvi, 357, 359]. A large scale experiment showed that infestation by *Platyedra gossypiella*, Saund. (pink bollworm) can be prevented by heating the cotton seed to a temperature of 140° F. for a few minutes before sowing. A spray of Bordeaux mixture at the time of the appearance of the flowers, followed by two sprays of fish-oil resin soap, appear to be sufficient to save the mango crop from injury by the mango hoppers [*Idiocerus* spp.].

Bondar (G.). **A broca da raiz do feijão.** [The Haricot Bean Root Borer.]—*Correio agric.*, vi, no. 3–4, pp. 53–56, 2 figs. Bahia, March–April 1928.

Conotrachelus phaseoli, Mshl. [*R.A.E.*, A, xvi, 229] oviposits on the collars of beans (*Phaseolus vulgaris*), the larvae boring into the roots which are thereby deformed. When the plants blossom the larvae leave the roots and pupate in the ground at a depth of about 1–3 inches, the weevils, which are nocturnal in habit, emerging 12–15 days later. The complete life-cycle lasts about 40–50 days; a second generation sometimes occurs. Infested plants are backward, the internodes being shortened and the foliage scanty. This weevil appears to be quite common in Bahia and in the neighbouring States, and infestations of from 20 to 80 per cent. of the plants have occurred. The control measures advocated are the destruction of native leguminous plants in the neighbourhood of bean fields before planting, and crop rotation.

BONDAR (G.). **Molestias nos cafezaes da Bahia.** [Pests in the Coffee Plantations of Bahia.]—*Correio agric.*, vi, no. 3–4, pp. 82–85. Bahia, March–April 1928.

Insect pests observed in coffee plantations at Lagôa Nova in Bahia were the Aleurodid, *Aleurothrixus floccosus*, Mask., and the Coccids, *Saissetia* (*Lecanium*) *oleae*, Bern., *S.* (*L.*) *hemisphaerica*, Targ., *Coccus viridis*, Green, and *Pseudococcus* sp., which are tended by ants. Of some 40,000 coffee bushes, upwards of 30,000 were rendered unproductive by these pests, which occurred also on orange, mango, guava, custard-apple [*Anona reticulata*] and cassava. In one case the foliage of cassava was infested by *Aleurothrixus aepim*, Goeldi.

BURGESS (A. F.). **Federal Gypsy Moth Work in Massachusetts.**—*Ann. Rep. Commiss. Conserv. & State For. 1927*, Pub. Doc. no. 73, p. 26. Boston, Mass. [1928.]

The situation presented by the gipsy moth [*Porthetria dispar*, L.] in Massachusetts is more serious than it has been at any time for a number of years. Though large consignments of parasites have been received from Europe and liberated, their increase in the field is affected by so many different factors that it is impossible to determine whether or how soon temporary relief from heavy defoliation will result. If natural control does not develop very rapidly, more intensive field remedial measures will have to be employed. During 1927 the defoliated area was nearly doubled, aggregating more than 130,000 acres. The moth increased over most of the territory, and in some areas this increase amounted to approximately 215 per cent.

BEUTENMULLER (W.). *Aserica castanea*: **A new Japanese Lawn Pest.**—*Bull. Brooklyn Ent. Soc.*, xxiii, no. 2, p. 68. Brooklyn, N.Y., April 1928.

The Japanese beetle, *Aserica castanea*, Arrow, occurred in a cemetery in Pennsylvania, the adults causing considerable damage to English ivy and other plants, though apparently not feeding on any trees, shrubs or flowers. The larvae are a serious pest of lawns; they feed on the roots of the grass, causing it to turn brown and die. Adults occur from the beginning of July to the middle of August, the damage to lawns being noticeable in September and October.

JONES (H. A.) & ROBBINS (W. W.). **The Asparagus Industry in California.**—*Bull. California Agric. Expt. Sta.*, no. 446, 105 pp., 43 figs., 28 refs. Berkeley, Cal., January 1928.

In the chapter of this bulletin dealing with the insect pests of asparagus an account is given of the bionomics of *Crioceris asparagi*, L., *Agromyza simplex*, Lw. (asparagus miner) and *Scutigerella immaculata*, Newp. (garden centipede), with recommendations for their control.

THOMAS (W. A.). **The Porto Rican Mole Cricket.**—*Fmrs.' Bull. U.S. Dept. Agric.*, no. 1561, 8 pp., 3 figs. Washington, D.C., April 1928.

An account is given of the bionomics and control of *Scapteriscus vicinus*, Scud., which is a pest of a variety of crops in Georgia and North and South Carolina [*cf. R.A.E.*, A, xiv, 67].

CARPENTER (F. F.). *Chironomus quadripunctatus*, **Malloch (Dipt.: Chironomidae).**—*Ent. News*, xxxix, no. 6, pp. 186–189, 2 pls. Philadelphia, Pa., June 1928.

Chironomus quadripunctatus, Mall., has been discovered infesting the stems of yellow pond-lilies, *Nymphaea advena*, in Indiana, wrinkling the leaves and turning them yellow. The larvae burrow into the stems from without, and after making their way, usually upward, through the porous stem, they cut exit holes in which they pupate. The adults emerge from these openings. An examination of the stems showed an average of 2·8 larvae in each of 134 infested stems. The tissue of the stems is destroyed directly by the feeding of the larvae and indirectly by the breaking of the epidermis, which opens the path for decomposition. Under laboratory conditions the pupal stage lasts 5–7 days, and the adult, though never observed to feed, was kept alive as long as 7 days. A description is given of the larva, pupa and adult, no eggs having been found.

HEINRICH (C.), U.S. Bur. Ent. **New Pine Moths from Japan.**—*Proc. Ent. Soc. Wash.*, xxx, no. 4, pp. 61–63, 1 pl. Washington, D.C., April 1928.

Four new species of moths are described, the larvae of which attack the young shoots of *Pinus thunbergi* in the vicinity of Yokohama, *viz.*, the Pyralid, *Salebria laruata* and the Tortricids, *Rhyacionia dativa*, *R. simulata* and *Petrova insignis*.

CHITTENDEN (F. H.), U.S. Bur. Ent. **An injurious Chinese Nut Curculio (Coleoptera: Curculionidae).**—*Proc. Ent. Soc. Wash.*, xxx, no. 4, pp. 69–70, 2 refs. Washington, D.C., April 1928.

Larvae of *Curculio haroldi*, Faust, of which the adult is described, were intercepted in the United States in chestnuts from China in 1923.

WHITE (G. F.), U.S. Bur. Ent. **Potato Beetle Septicemia, with the proposal of a new Species of Bacterium.**—*Proc. Ent. Soc. Wash.*, xxx, no. 4, pp. 71–72, 3 refs. Washington, D.C., April 1928.

This is a preliminary record of a bacterial disease that kills the larvae of *Leptinotarsa decemlineata*, Say. It is markedly characterised by septicaemia and is caused by *Bacillus leptinotarsae*, sp.n., found in the larval blood. Infected larvae may be found clinging to the potato plant ; the dead ones are usually on the ground.

BRITTON (W. E.). **Twenty-seventh Report of the State Entomologist of Connecticut, 1927.**—*Connecticut Agric. Expt. Sta.*, Bull. 294, pp. 198–299, 16 pls., 11 figs. New Haven, Conn., February 1928.

Notes are given on the insect pests occurring in Connecticut during 1927, most of which have been dealt with in recent reports [*R.A.E.*, A, xiv, 439 ; xv, 496, etc.]. Aphids were more abundant on all kinds of trees and plants than they have been for many years ; in particular, *Aphis pomi*, DeG., was present in enormous numbers and attacked and injured young apple fruit in a similar manner to *Anuraphis roseus*, Baker. Other pests calling for special attention included *Psila rosae*, F. (carrot rust fly), which attacks the roots of carrot, parsnip, celery and parsley, the eggs being deposited in crevices of the soil round the plants, and apparently has two generations in a year ; the Coccid, *Lecanium fletcheri*, Ckll., on arborvitae [*Thuja occidentalis*] ; the Aphid, *Hyalopterus arundinis*, F., on plum ; *Monophadnus* (*Monophadnoides*) *rubi*, Harr., on raspberries ; and *Cryptorrhynchus lapathi*, L., on willows. *Trioza tripunctata*, Fitch (blackberry Psyllid) feeds on native blackberries and sometimes attacks the cultivated varieties. The adults emerge from hibernation in the spring and deposit eggs on the unfolding leaves and young canes, and the plant becomes distorted owing to the loss of sap when the nymphs are feeding on the leaves.

ASHWORTH (J. T.) & BRITTON (W. E.). **Gipsy Moth Work in Connecticut, 1927.**—*Connecticut Agric. Expt. Sta.*, Bull. 294, pp. 231–246, 1 fig. New Haven, Conn., February 1928.

A detailed account is given of scouting, spraying and other control measures against the gipsy moth [*Porthetria dispar*, L.] in Connecticut. During 1927, 596,000 individuals of the egg parasite, *Anastatus bifasciatus*, Boy., were liberated in the State. No conspicuous defoliation of trees by *P. dispar* occurs in Connecticut, probably owing to the energetic measures taken and the prompt eradication of newly discovered colonies. A map shows the present quarantined area in the State, and the text of the latest quarantine order is given.

BRITTON (W. E.) & ZAPPE (M. P.). **Operations for the Control of the European Corn Borer.**—*Connecticut Agric. Expt. Sta.*, Bull. 294, pp. 246–256, 1 fig. New Haven, Conn., February 1928.

Pyrausta nubilalis, Hb. (European corn borer) has appeared in Connecticut each year for the past five years, usually in the coast towns, the infestation never becoming general throughout the State. In each case the fields have been cleaned and the maize stalks and weeds buried. A table shows the localities infested during the past five years, and the latest quarantine regulations are quoted, with a map showing the quarantined areas.

ZAPPE (M. P.) & STODDARD (E. M.). **Further Reports on Spraying and Dusting of Apples.**—*Connecticut Agric. Expt. Sta.*, Bull. 294, pp. 256–261. New Haven, Conn., February 1928.

The results of further experiments in spraying and dusting of apples, in which the same formulae were used as in the previous year [*R.A.E.*, A, xv, 499], are given. The best results were obtained by spraying, but dust gave better control of scab, probably owing to the delay in applying the liquid at the time of the calyx application when scab infection occurred.

GARMAN (P.). **The Oriental Peach Moth in Connecticut.**—*Connecticut Agric. Expt. Sta.*, Bull. 294, pp. 263–271, 3 figs. New Haven, Conn., February 1928.

Life-history studies of the oriental peach moth [*Cydia molesta*, Busck] have been continued [*R.A.E.*, A, xv, 499], and maps show its distribution and abundance in 1926 and 1927 in Connecticut. The numbers increased during 1927, and there was a distinct increase in the infestation of quinces. In one county, however, the infestation was reduced to about 10 per cent., partly by parasites and partly by thorough cultivation of the soil. Work during the year consisted of maintaining bait pans, applying insecticides in the field, cage records and tests of larvicides, ovicides and repellent sprays. The bait used was a thick refiners' syrup diluted to 1 : 20 in water, which gave better results than the molasses used in the previous year. It would be desirable, however, if fermentation could be stopped by some preservative after the most effective period is reached, as the fermented bait becomes foul and loses all attractiveness. Only a partial fourth generation of the moth was obtained. The first adults begin to emerge in early May, the peak of emergence occurring in early June. The moths continue to fly until the cold weather and have been caught several weeks after harvesting the crop. In spring, moths from cocoons protected from sunlight emerge much later than the others. Emergence data and bait pan records suggest that cultivation of the ground against the pupating larvae should be completed by the beginning of May. Numbers of the egg parasite, *Trichogramma minutum*, Riley, were liberated ; it will probably be necessary to rear these in large numbers each year in order to get them established. Preliminary field tests were conducted in the hope of finding a substitute for arsenicals that could safely be used on peaches ; in particular, oil emulsions as ovicides and sodium fluosilicate to poison the larvae were tried, and the results showed some promise. Foliage injury by the fluosilicate was prevented by the addition of glue and lime. The present recommendations are to maintain thorough cultivation from May until August, breaking the soil as near to the trunks of the trees as possible, and to use paradichlorobenzene as for the control of the peach borer [*Aegeria exitiosa*, Say]. These measures cannot be expected to give complete control, but are the best that can be suggested at the moment. An artificial food mixture containing small amounts of magnesium citrate produced better results in larval development than those tried in the previous year [*loc. cit.*].

GARMAN (P.). **Weather Conditions accompanying the Aphid Outbreak in Connecticut in 1927.**—*Connecticut Agric. Expt. Sta.*, Bull. 294, pp. 271–276, 4 figs., 4 refs. New Haven, Conn., February 1928.

Studies of the rain and temperature charts in Connecticut during the last few years, considered with reference to the outbreak of Aphids in orchards in 1927, lead to the conclusions that the growth of the plant is the most important factor in outbreaks of the kind then experienced, and probably rainfall is indirectly influential, promoting a rich, succulent growth that favours Aphid abundance. Sudden, heavy rain doubtless destroys many Aphids, but this did not seem to have much effect in 1927. Probably continuous rainy periods when the ground is kept soaked are more effective in producing favourable conditions than infrequent downpours. In 1925 the high temperatures in early June probably promoted development of the parasites or increased the tendency to migration among the Aphids, which caused them to disappear from the trees.

GARMAN (P.). **Tests with Insecticides designed to do the Work of Nicotine Sulphate.**—*Connecticut Agric. Expt. Sta.*, Bull. 294, pp. 277–278. New Haven, Conn., February 1928.

The insecticidal qualities of derris and pyrethrum extracts are briefly discussed. Laboratory experiments indicate that both have considerable value against Aphids, but their success for orchard use will depend on their ability to combine with other insecticides and fungicides. Their present cost, moreover, does not seem to be less than that of nicotine sulphate when used in spray form, and it is not known how they will keep.

BRITTON (W. E.) & JOHNSON (J. P.). **Report of Activities to control the Japanese Beetle in 1927.**—*Connecticut Agric. Expt. Sta.*, Bull. 294, pp. 281–288, 1 fig. New Haven, Conn., February 1928.

The work done against the Japanese beetle [*Popillia japonica*, Newm.], consisting largely of quarantine and scouting activities, is recorded ; the inspection work is described, and the revised quarantine regulations are quoted.

BRITTON (W. E.) & JOHNSON (J. P.). **Report of Asiatic Beetle Control and Quarantine Work in 1927.**—*Connecticut Agric. Expt. Sta.*, Bull. 294, pp. 288–291. New Haven, Conn., February 1928.

An account is given of a survey of Connecticut for the Asiatic beetle [*Anomala orientalis*, Waterh.]. Scouting was done on a large scale, and soil treatment was practised extensively. Infestations seemed to be no more intense than in the previous two years, but the invasion was more widespread.

HUFF (C. G.). **Nutritional Studies on the Seed-corn Maggot,** *Hylemyia cilicrura* **Rondani.**—*J. Agric. Res.*, xxxvi, no. 7, pp. 625–630, 1 fig., 4 refs. Washington, D.C., 1st April 1928.

Investigations were undertaken on the food requirements of the larva of *Phorbia* (*Hylemyia*) *cilicrura*, Rond., with special reference to the part played by the bacteria present. It was also desired to learn whether bacterial action must precede a larval attack upon potato seed pieces, sprouting maize and other susceptible plants. It was found that the presence of bacteria, *per se*, is not essential to the development and pupation of the larvae ; but by their action on the medium they sometimes prepare a suitable substratum for larval growth.

The following is taken from the author's summary of the results of his experiments, the technique of which is described : Leach's observations [*R.A.E.*, A, xiv, 269] that sterile larvae do not mature on sterile beef-extract agar or potato plugs, whereas larvae grow normally on contaminated potato plugs, are confirmed. Experiments using bacteria-free filtrate from unheated potatoes indicate that the failure of larvae to grow on heated potato is not due to the destruction of thermolabile substances such as enzymes. Attempts to grow larvae on sterile potato to which had been added a suspension of heated bacteria were unsuccessful. Potato plugs, beans and peas that had partly decomposed and were then sterilised by heat proved to be good media for growth. Flies were reared from egg to adult on such media and found to be bacterially sterile. Attempts to grow larvae on potato that had been submitted to artificial digestion by saliva and pancreatic juice were unsuccessful. Growing bean and pea seedlings free from bacteria were found to provide a suitable medium for complete development.

Searls (E. M.). **A simple Method for Life-history Studies of Root-feeding Arthropods.** —*J. Agric. Res.*, xxxvi, no. 7, pp. 639–645, 4 figs. Washington, D.C., 1st April 1928.

A method is described of rearing insects that spend all or part of their life-cycle in the soil, by means of which numerous specimens are immediately accessible for observation at any stage of their development. This method, which has proved adaptable for use with various other insects, was employed in the study of *Diabrotica vittata*, F. (striped cucumber beetle).

Beetles of both sexes were caged in 12-mesh wire screen cloth cylinders 10 cm. long and 6 cm. in diameter. The cages were placed on moist green blotting paper lying on loose soil heaped up in tin dishes. The beetles oviposited through the wire mesh on the paper, and the eggs were easily removed by slow and careful drying of it. They were then transferred to incubation cells of glass tubing, 3 cm. in diameter, 2·3 cm. in height, and closed at one end with plaster of Paris, which were placed, with the open end upward, in soil in dishes to a depth of 0·3 cm. The plaster of Paris, which was painted with black indian ink to make the larvae and eggs easily visible, was kept moist only by adding water to the soil at intervals, the presence of free water being fatal to the embryos and young larvae.

For rearing the larvae, seedling food-plants were placed in Petri dishes containing plaster of Paris about 6 mm. in thickness, on which their roots were spread out. Blotting paper, cut to fit the sides of the dishes closely except where the stems of the plants extended from them, was spread over the roots. The whole was then saturated with a nutrient fluid, the formula for which is given, and covered with glass. The daily addition of about 4 cc. of this solution to each dish maintained the requisite moisture. Care should be taken to prevent contamination by algae. On reaching the prepupal stage larvae were removed to pill boxes containing moist soil. Under the conditions of this method *D. vittata* completed its life-cycle on an average 3 days sooner than under natural conditions.

McDaniel (E. I.). **The Principal Bulb Pests in Michigan.**—*Spec. Bull. Mich. Agric. Expt. Sta.*, no. 173, 23 pp., 12 figs., 8 refs. East Lansing, Mich., April 1928.

The greater part of the information given in this paper concerning the bionomics and control of *Eumerus strigatus*, Fall. (lesser bulb fly) and *Merodon equestris*, F. (larger bulb fly) has already been noticed [*R.A.E.*, A, xiv, 654 ; xv, 460 ; xvi, 107].

Rhizoglyphus hyacinthi, Banks (bulb mite), which is briefly described, is a universally distributed pest attacking a variety of bulbs, dahlia roots, orchids and onions, narcissus and lily bulbs suffering most severely on account of the looseness of their scales, which afford an easy entry to the mite. The eggs are laid singly on the scales, one female laying from 50 to 100. The mites are most active at temperatures between 60 and 80° F., and become torpid below 55° F. The life-cycle may be completed in 30 days at midsummer under glass. The females live for about a month, while the males disappear within ten days. The larvae hatch in 1–7 days and feed for 1–3 days before entering the first quiescent stage, which lasts 2 days and from which nymphs emerge to feed for 2 days before entering a second quiescent stage of 2 days. After moulting, the nymphs again feed for 1–4 days before entering the third quiescent stage of 2 days, after which the adults appear. When moisture, temperature or food conditions become unfavourable, however, a hypopus stage develops after the second quiescent period, in which the mite is resistant to the adverse conditions, active, and ready to attach itself to any moving object. Several weeks may elapse before the hypopus transforms into the nymph that finally produces the adult. The mites prefer solid and healthy to wet and decaying bulbs, feeding by scraping the surface of the scales, thus forming a lesion that favours the development of other pests and diseases. As the bulb becomes soft, the hypopus stage of the mite appears and is carried to healthy bulbs by insects, etc. Bulbs infested just before they are removed from the soil may deteriorate rapidly, or, if stored under conditions that render the mite torpid, may not develop injury until placed in the ground. There appear to be no remedial measures that repay the effort expended on them, an adequately high temperature in the hot water treatment rendering the bulbs worthless, while fumigations are not effective. Most of the mites are killed when bulbs are left for 10 minutes in 40 per cent. nicotine sulphate, 1 : 400, heated to 122° F., though bulbs so treated often fail to flower. Cultural practices that contribute to the control of the mite include the planting of only healthy bulbs on well prepared, carefully drained soil ; the immediate destruction of all rotten bulbs as soon as they are detected; and the storing of bulbs at temperatures unfavourable to the mites, the development of which is checked below 35° F.

Macronoctua onusta, Grote, attacks both wild and cultivated varieties of iris, infestation being apparently more severe on poorly drained soil. The adult and larva are briefly described. There is only one generation a year, the moths appearing in September and October and laying eggs on the foliage. The larvae do not hatch till early in the following

June, when they make their way to the roots of the plant, in which they tunnel, taking from 8 to 10 weeks to complete their growth. The pupal stage lasts 2 or 3 weeks. Under natural conditions, this moth is held in check by natural enemies, particularly Tachinid parasites. The presence of the larvae in iris roots causes a breaking down of the tissue, which is followed by a rot that is attractive to *Eumerus strigatus*. Preventive measures include growing plants where drainage is good; infested plants may be treated with mercury bichloride as used against *Eumerus*, applications being started early in the season and continued up to the middle of June. Seriously infested roots should be dug up and destroyed, while the destruction of dead foliage in spring may get rid of some of the eggs.

HEADLEE (T. J.). **Report of the Department of Entomology.**—*Rep. New Jersey Agric. Expt. Sta. 1926–1927*, pp. 111–156, 2 pls. New Brunswick, N.J., 1928.

In addition to a list of insect pests recorded in New Jersey during the years 1926–27, notes are given on insects of particular economic importance. The activity of *Cydia* (*Carpocapsa*) *pomonella*, L. (codling moth) varies according to the climatic zone in which observations are made. Studies have been made at five stations, in areas of different types; in several years' experiments the average number of day degrees of effective temperature required for the emergence of *C. pomonella* was 360 for the overwintering generation, and 1,339·91 for the first summer generation. Reference is made to the application of the bioclimatic law to emergence of the hibernating generation. The results of the measures for the control of *C. pomonella* [*R.A.E.*, A, xv, 259] are summarised; in 1927 greater emphasis was laid on the destruction of the first generation as a primary control measure, which has the advantage of leaving the fruit with the minimum amount of spray residue at picking time.

In laboratory experiments and a small scale field test with a large number of spray combinations, it was found that oil emulsion and 0·2 per cent. of 40 per cent. nicotine (free), and oil emulsion and 0·5 per cent. crude cresol give 100 per cent. control of the overwintering eggs of apple Aphids and *Paratetranychus pilosus*, C. & F., without appreciably injuring the trees, which at the time of the field spray were at the delayed dormant stage.

GINSBURG (J. M.). **Investigations of Dusts, Spreaders, Stickers and Diluents for spraying and dusting Mixtures.**—*Rep. New Jersey Agric. Expt. Sta. 1926–1927*, pp. 127–133, 1 pl. New Brunswick, N.J., 1928.

Some of these investigations, carried out with the object of discovering a more efficient corrective than hydrated lime for eliminating arsenical injury to foliage and fruit, have already been noticed [*R.A.E.*, A, xvi, 135]. Field tests were made on young peach trees, which were selected on account of their great susceptibility to arsenical injury, with mixtures consisting of 8 lb. sulphur, 1 lb. acid lead arsenate ($PbHAsO_4$), ½ lb. skimmed milk, and the chemical tested, in varying quantities, mixed in 50 U.S. gals. water. Injury appeared when hydrated lime, calcium silicate, aluminium oxide, aluminium palmitate and charcoal were used; none could, however, be detected when 3 to 4 lb. ferric oxide was used, and this mixture exhibited very good adhesive qualities. These experiments were carried out during the summer, and as foliage is more susceptible to arsenical injury in the spring, further tests, which have not yet been completed, were undertaken. A compound of ferric oxide, which is partly colloidal, fluffy and very light, occupying about three times the volume of lead arsenate, and a ferric oxide contained in an iron ore consisting of about 85 per cent. ferric oxide and 15 per cent. insoluble impurities were used in the spray above mentioned. The results with the colloidal ferric oxide confirmed those previously obtained and suggest that it can be used advantageously as an adhesive and possibly as an efficient corrective to eliminate arsenical injury. With the iron ore some foliage injury occurred, and the spray did not adhere so well. The adhesion of ferric oxide is thought to be due to the particles, which bear positive electrical charges, being attracted to the leaf surfaces, which are believed to bear negative electrical charges, and to the fact that the ferric oxide by virtue of its great absorbent properties takes up moisture readily from the leaf and becomes partially hydrated. Under these conditions, Fe_2O_3 molecules are in intimate chemical contact with the H_2O molecules of the leaf, possibly in the form of hydrated ferric oxide, and it is conceivable that the particles retain the lead arsenate particles with which they are intimately mixed.

An attempt has also been made to obtain an adhesive insecticide dust by incorporating certain compounds that possess great adhesive properties but are not soluble enough in water to react with lead arsenate. Such properties are found in soaps of heavy metals and of the alkaline earths ; but dusts containing these materials did not show sufficient additional adhesive properties to warrant their use. A dust covered with 2 per cent. of fish or refined mineral oil, by spraying it during the mixing process, gained in adhesive power, but caused injury to fruit and foliage and brought about considerable leaf drop. A dust mixture of 10 lb. lead arsenate, 60 lb. sulphur and 30 lb. ferric oxide was applied to apple trees on 4th August ; in spite of heavy rainfall a coat of dust remained on the fruit and foliage on 24th September. In further tests greater adhesion was obtained with sulphur dust containing 10 per cent. lead arsenate coated with 2 per cent. ferric oxide than when 20 per cent. ferric oxide was mechanically mixed in the dust ; it is suggested that this possesses sufficient adhesion on fruit and foliage successfully to replace sprays.

Experiments were also made with vegetable, animal and mineral oils to find some variety that would impart adhesive qualities to a dust without injuring plants ; the oils selected were emulsified with 1 to 2 per cent. powdered skimmed milk, using 66 per cent. oil and 34 per cent. water. Sperm oil and a proprietary brand of highly refined mineral oil were the only varieties that caused no injury to apple or peach foliage when applied in concentrations of 2 per cent. or less.

BECKWITH (C. S.) & DRIGGERS (B. F.). **Report of the Cranberry Substation.**—*Rep. New Jersey Agric. Expt. Sta. 1926–1927,* pp. 134–141. New Brunswick, N.J., 1928.

False blossom, which is becoming more prevalent in cranberries in New Jersey, spreads particularly rapidly in the strong vegetative growth of new bogs ; it is thought that the spread of the disease may be due to leafhoppers.

Factors influencing the use of lead arsenate on cranberry bogs are discussed. The solubility of this substance is not increased when it is suspended in the acid waters obtained from the bogs, even when the mixtures are allowed to stand for over a year; some constituents, possibly the weak acids or a small amount of soluble iron in the bog water, exert a depressing effect on the solubility of the arsenate. Bog soils high in organic matter produce appreciable amounts of soluble arsenic when acid lead arsenate is mixed with the soil, but the reactions taking place are not known. Three-year sprayings with acid lead arsenate and bog water indicate that there is a cumulative injury to cranberries. It appears that soluble arsenic liberated by the lead arsenate after it reaches the soil is absorbed by the roots of the cranberry plant, resulting in injury; cuttings were killed in pots of peat soil that contained only 1 part in 3,000 of acid lead arsenate. Considerable amounts of soluble arsenic are brought into solution when acid lead arsenate, resin fish oil soap and bog water are used in the proportion of 3 lb. lead arsenate, 2 lb. soap and 50 U.S. gals. water, resulting in the scorching of cranberry foliage. A combined Bordeaux and acid lead arsenate spray to which resin fish oil soap is added does not scorch the foliage, the excess lime of the Bordeaux mixture apparently removing from the solution any soluble arsenic produced by the action of the soap.

Larvae of the blossom worm [*Epiglaea apiata*, Grote], found on 8th June, made cocoons between 28th June and 19th July. Pupation began on 1st September, and adults emerged towards the end of the month. Oviposition began on 1st October, the eggs being laid on the leaves and stems and sometimes on the ground. The Ichneumonid, *Sagaritis oxylus*, Cress., infested 36 per cent. of one batch of larvae, the adults emerging from the dead host larvae between 18th and 20th June. Over 50 per cent. of a batch of larvae collected on 12th June were infested with one or more Tachinid eggs, while others collected on 12th July were nearly all parasitised by *Sarcophaga helicis*, Tns., and died within a week, the adults of the parasite emerging from the dead bodies of the larvae in 3 weeks. The larvae of *S. helicis* sometimes occur in decaying animal manure.

The information given with reference to the cranberry root worm, *Rhabdopterus picipes*, Ol., on blueberries has already been noticed [*R.A.E.*, A, xv, 433]. Galls caused by the Chalcid, *Hemadas nubilipennis*, Ash., are very common on some varieties of blueberry, and it is recommended that they should be cut off and burnt.

KINCAID (T.). *Lecanium coryli.—Sp. Pub. California Dept. Agric.*, no. 73, pp. 43–44. Sacramento, Cal., 1927.

The Coccid, *Lecanium coryli*, L., which has appeared in Washington during the last three years, was evidently introduced from British Columbia, and is spreading with great rapidity through the northern part of the State towards the coast. It is presumed that the immature stages are carried from tree to tree by birds or possibly insects. At least 35 species of plants are attacked, including blackberry and raspberry. A small Chalcid parasite has recently been found in Washington and seems likely to become very effective. It has been suggested that the parasites of *Lecanium* in California should be introduced.

Narcissus-Bulb Quarantine. Revised Regulations under Notice of Quarantine no. 62.—*U.S. Dept. Agric., Fed. Hortic. Bd.*, 6 pp. Washington, D.C., April 1928.

This revision of the regulations governing the inspection and certification of narcissus for interstate movement includes several minor changes but retains the important features of the regulations already in effect [*R.A.E.*, A, xiv, 492 ; xv, 534]. If bulbs are infested with bulb flies (*Merodon equestris*, F., and *Eumerus* spp.) alone, the time of immersion in hot water is one hour, computed from the time the water regains the loss of temperature occasioned when the bulbs are submerged. When fumigation with carbon bisulphide is substituted, the mercurial vacuum required is 21 inches.

MACKIE (D. B.). **Problems pertaining to Treatments for the Elimination of Bulb Pests.**—*Sp. Pub. California Dept. Agric.*, no. 73, pp. 57–60. Sacramento, Cal., 1927.

Some of the numerous factors that may affect the results of treatment of narcissus bulbs against pests by immersion in hot water are discussed. Sludge from the bulbs deposited on the steam coils may retard convection ; dead scales loosened from the outside of the bulb may cause trouble unless properly screened out ; sediment may partly block pipe lines and clog drains.

The optimum time for treatment of narcissus bulbs appears to be as soon as possible after they have been cured and dried and before the inflorescence is developed. Imported bulbs usually arrive with elaboration of the floral bud well advanced. The specific gravity of a bulb depends on its degree of dryness and varies from 0·95 to 1·05. The specific heat of a bulb is about 0·75. It takes 3½ cu. ft. of bulbs to displace 1 cu. ft. of water, and the temperature of the water decreases in exact ratio to the amount of bulbs placed in it at one time. The amount of heat units for transfer is governed by the amount of water, and as the reservoir of available heat is diminished there is a more rapid drop in temperature and a correspondingly slow recovery. Thus placing baskets in the vat at regular intervals disturbs the temperature much less than loading the whole vat at one time, and also adds to the uniformity of treatment of each lot. Bulbs have a rather low degree of conductivity, and the time required to heat them varies with the initial temperature and with the extent of agitation of the water, the temperature of the bulb being raised twice as fast in agitated as in still water. Bulbs should be graded according to size before dipping.

MORRILL (A. W.). **Pest Control Problems on the West Coast of Mexico.**—*Sp. Pub. California Dept. Agric.*, no. 73, pp. 70–82. Sacramento, Cal., 1927.

As a result of five years' experience in conducting general survey work, the situation with regard to pests of crops on the West Coast of Mexico is described [*R.A.E.*, A, xiii, 627 ; xiv, 456]. Aeroplane dusting against tomato pests is discussed [*R.A.E.*, A, xiv, 646]. Pests not mentioned in the papers referred to are : *Gargaphia solani*, Heid. (common egg-plant lace-bug), which sometimes causes damage but may be controlled by fish-oil soap (7–8 lb. to 50 U.S. gals. water) ; *Trichobaris mucorea*, Lec. (western potato stalk-borer), which damaged potato plants and on one occasion attacked the stalks of old egg-plants

[*Solanum melongena*]; an unidentified beetle, closely related to the Colorado potato beetle [*Leptinotarsa decemlineata*, Say], which developed into a pest of egg-plants but was readily controlled by calcium arsenate; a single individual of *Phthorimaea operculella*, Zell. (potato tuber moth), found on a potato leaf; a Pentatomid, *Mormidea angustata*, Sign., which on rare occasions is sufficiently numerous to injure rice kernels in the milk stage; *Lissorhoptrus simplex*, Say (rice water weevil), which apparently does very slight damage; *Alabama argillacea*, Hb., which was present in destructive numbers on cotton in 1925, but was controlled with calcium arsenate dust; the salt marsh caterpillar [*Estigmene acraea*, Dru.], which was destructive to cotton in the Yaqui Valley in 1925 and proved very difficult to combat since the almost fully grown larvae were very resistant to arsenicals; and various species of cotton stainers, including *Dysdercus ruficollis*, L., *D. obliquus*, H.-S., *D. concinnus*, Stål, and *D. obscuratus*, Dist., which have done no noticeable damage to cotton bolls or lint.

Notice of Quarantine no. 3 on Account of the European Corn Borer and Rules and Regulations supplemental thereto.—*Bull. W. Virginia Dept. Agric.*, no. 71, 7 pp. Charleston, W.Va., March 1927.

Pyrausta nubilalis, Hb., not previously known to occur in West Virginia, now exists in three counties. A State quarantine of these counties became effective on 10th January 1927.

Modification of Nursery Stock, Plant and Seed Quarantine Regulations. Amendment no. 4 of Revised Rules and Regulations supplemental to Notice of Quarantine no. 37.—*U.S. Dept. Agric. Off. Secy.*, mimeograph, 2 pp. Washington, D.C., 24th July 1928.

The effect of this amendment to regulations already noticed [*R.A.E.*, A, xv, 390] is to prohibit the importation of stocks of apple, pear, quince and mazzard cherry under permit or otherwise after 30th June 1930, and also that of mango seeds. The amendment takes effect on 1st August 1928.

Amendment no. 3 to Rules and Regulations (Sixth Revision) Supplemental to Notice of Quarantine No. 48.—*U.S. Dept. Agric., Fed. Hortic. Bd.*, S.R.A., no. 93, pp. 144–147. Washington, D.C., March 1928.

The quarantine against the Japanese beetle [*Popillia japonica*, Newm.] [*R.A.E.*, A, xv, 297] is amended as from 1st November 1927 to include new territory. Action has been deferred with respect to certain outlying points where the beetle may become established, in order to demonstrate the possibility of eradicating such infestations. No definite soil infestation has been found in these places, and in many cases only a single beetle has been observed. If the measures fail to eradicate the beetle and it appears in the following summer, the quarantine will immediately be extended to include the infested areas. In the meantime movement of articles restricted on account of *P. japonica* will only be permitted in compliance with restrictions identical with those enforced in quarantined areas. Isolated infestations are likely to develop in future at points very widely remote from the quarantined area, owing to accidental carriage by cars, railways, etc., and it is hoped to determine from this experiment what can be done by radical measures to stamp them out. Otherwise these outlying points would have to be quarantined and would then be automatically subjected to the possibility of general infestation from the movement that is permitted within the quarantined area of nursery stock, etc., with the result of actually accelerating the spread of the pest.

Fruit-fly Investigation and America's Quarantine upon Spanish Agricultural Products.—*U.S. Dept. Agric., Fed. Hortic. Bd.*, S.R.A., no. 93, pp. 142–144. Washington, D.C., March 1928.

At the request of the Spanish Government an inspector of the U.S. Federal Horticultural Board was sent to Spain in the summer of 1927 to investigate the extent of the infestation of the fruit-growing areas by the Mediterranean fruit-fly [*Ceratitis capitata*, Wied.], since quarantines against this insect prohibit the importation of Spanish grapes, oranges and tomatos [*cf.* *R.A.E.*, A, xii, 123; xiii, 330; xv, 378]. The survey showed that *C. capitata* still exists throughout the grape-growing districts of Almeria. In the Canary Islands no evidence of infestation by *C. capitata* was found in tomatos, though oranges and other fruits were heavily attacked. Examinations of tomatos made in Spain also failed to show any signs of infestation. The quarantine prohibiting the importation of Spanish grapes and oranges cannot, therefore, be modified, but the entry of tomatos from Spain and the Canary Islands will be authorised under permit, provided that such tomatos remain free from injurious insects.

Fruit and Vegetable Quarantine (No. 56).—*U.S. Dept. Agric., Fed. Hortic. Bd.*, S.R.A., no. 93, pp. 141–142. Washington, D.C., March 1928.

In connection with this quarantine the Italian Embassy has arranged with the Italian Department of Agriculture to treat or supervise the treatment of all shipments of chestnuts from Italy prior to forwarding them to the United States, a certificate of treatment to accompany the invoice together with a statement that the chestnuts are believed to be free from living injurious insects, particularly *Cydia* (*Laspeyresia*) *splendana*, Hb., and *Curculio* (*Balaninus*) spp. If, however, shipments are found to contain living insects, the condition of the shipment will be brought to the attention of the Embassy before action is taken. Infested shipments are to be removed from American territorial waters, destroyed, or treated by heating the nuts in water, bringing the temperature up to 122° F. and maintaining them at this temperature for 45 minutes. Infested shipments may, however, be released for processing or utilisation in manufacture provided that the treatment to be given will destroy all the insects contained.

MARLATT (C. L.). **The Work of the Federal Horticultural Board in 1927.**—*J. Econ. Ent.*, xxi, no. 3, pp. 463–469. Geneva, N.Y., June 1928.

Most of the information contained in this paper has already been noticed from another source [*R.A.E.*, A, xvi, 271]. In view of the finding of fruit-flies in fruit imported from Argentina over a year ago, a survey was made which demonstrated that the infested fruit came from a region in the north of the country, the main fruit-exporting districts being not only free from infestation, but geographically and commercially isolated from invasion by these insects [*cf.* *R.A.E.*, A, xvi, 255]. The Department, therefore, authorised the continuance of entry of fruits from these districts subject to the issue of permits embodying certain requirements, which are enumerated. In spite of an agreement [see preceding paper] a number of shipments of infested chestnuts were received in New York from Italy. Further entry of these nuts was refused unless arrangements could be made to give them hot water treatment at New York. These treatments proved entirely effective, and it is believed that they will hereafter be given in Italy.

FRACKER (S. B.). **Narcissus Inspection Problems.**—*J. Econ. Ent.*, xxi, no. 3, pp. 470–476. Geneva, N.Y., June 1928.

A total of over 95,000,000 bulbs, at present being grown in the United States, must all be inspected twice and certified before shipment is permitted. Field inspections are begun in the south in January, and storage inspections begin there at the end of May. As far north as the Canadian border field inspections are completed about the middle of June, while storage inspections are in progress throughout the States during June, July and August. Narcissus is grown in all but sixteen States, and one or more infestations of *Merodon equestris*, F., *Eumerus strigatus*, Fall., or Nematodes have been found in many of them. Some modifications of the present procedure for securing treatment and certification of planting stock, and recommended changes relating to financial and technical assistance to the States, investigations and quarantine regulations are discussed.

PADDOCK (F. B.). **The Control of the Beemoth.**—*J. Econ. Ent.*, xxi, no. 3, pp. 489–494. Geneva, N.Y., June 1928.

The factors controlling the bee-moth [*Galleria mellonella*, L.] are briefly reviewed from the literature. Climate which is the primary natural factor, appears to be chiefly dependent on altitude, though humidity may be regarded as a limiting factor under certain conditions. Bee-keeping is conducted in Austria in mountainous regions at elevations safely above the range of the moth, while in Sweden, where it is common among bees kept on the coastal area, it disappears in the mountains. In Colorado, Wyoming and Montana, where a similar restriction of the moth is known to exist, the critical elevation seems to be between 4,000 and 5,000 ft. The spread of the moth in England has been slow, and it has never caused any outstanding loss to the industry, nor has any severe loss been caused in Scotland, although the moth is generally found all over the country.

There is no real control of the moth by means of parasites, those hitherto recorded being, with one exception, primarily parasites of other economic pests.

A brief account of the various methods of artificial control employed since 1623, the more modern ones including traps, sanitation, the use of various fumigants and repellents, heat and cold, indicates that very little is known about the subject.

DE ONG (E. R.). **Petroleum Oil as a Carrier for Nicotine.**—*J. Econ. Ent.*, xxi, no. 3, pp. 502–504. Geneva, N.Y., June 1928.

The general application of petroleum oil as a dormant or foliage spray has been made possible only by the use of the more highly refined fractions containing a minimum of unsaturated hydrocarbons. The oils now used are so inert that their insecticidal value is lowered, but their potential value as wax solvents and penetrants of minute apertures and their wetting powers are retained. A combination of refined oil with nicotine will thus improve the efficiency of each. One of the advantages to be secured from such a combination is the fact that volatile oils, which are cheaper and safer for use on foliage than the more viscous types, may act equally well as carriers for nicotine. Experiments carried out on *Lecanium corni*, Bch. (brown apricot scale) show a considerable increase in toxicity by the addition of small amounts of nicotine (0·01–0·02 per cent.) to oils, particularly kerosene. The difference between the types of oil is not so great as between oil and oil-nicotine combinations. The nicotine and kerosene combination is about as effective as nicotine and lubricating oil at about one-quarter the cost and with much less danger to foliage. Lubricating oil with a viscosity of 100–110 sec. proved less effective than that with a viscosity of 50–60 sec. Nicotine-oil combinations, while not offering much advantage for dormant spraying, appear promising for foliage applications.

FROST (S. W.). **Notes on Oil-Emulsions with special Reference to Aphis on Apple.**—*J. Econ. Ent.*, xxi, no. 3, pp. 504–506. Geneva, N.Y., June 1928.

Investigations begun in 1924 indicate that a degree of control of *Anuraphis roseus*, Baker (rosy apple aphis) can be obtained with delayed dormant sprays of cold-mixed oil emulsions, using 1 lb. calcium caseinate, 3 U.S. gals. engine oil and 100 U.S. gals. water. Several brands of engine oil were used, as well as kerosene as a very volatile and light oil, and Sunoco (1–20) as an oil of high viscosity. Infested branches gathered from apple trees in April were sprayed at 50 lb. pressure, the nozzle being held 3 or 4 ft. from the branches. A light application secured a mortality of 4·1 per cent. with kerosene, 1·3–20 with the engine oils, and 44·7 with Sunoco, while with a drenching spray the percentages were 41·4, 98·2–100 and 100, respectively. The Aphid counts were made the day following the application. Counts of red spider [*Tetranychus*], made a week later when the eggs were hatching, showed a mortality of 60–76 per cent. with a light application of engine oils, mortality with kerosene being very low. In a second series of tests counts of clusters infested by Aphids were made on 1st June on trees sprayed on 13th April. In this series the best results were secured with kerosene, only 2·4 per cent. of the clusters sprayed with it showing infestation. The following year a 100 per cent. kill was secured with a delayed dormant application of Sunoco applied at 200 lb. pressure, when branches thoroughly covered with oil were selected for examination. Where branches were selected at random, however, the mortality only amounted to 38·3 per cent. It appears, therefore, that only a small percentage of kill can be secured by spraying even under the best conditions, while drenching certainly gives a high mortality percentage. No scorching was caused by cold-mixed emulsions on trees from 2 to 12 years old, even when the oils were applied as late as June.

PORTER (B. A.) & SAZAMA (R. F.), U.S. Bur. Ent. **Codling Moth Banding Materials.**—*J. Econ. Ent.*, xxi, no. 3, pp. 507–510, 2 refs. Geneva, N.Y., June 1928.

The following is the authors' abstract of this paper: Preliminary tests of several materials for banding against codling moth [*Cydia pomonella*, L.] are here reported. The results indicate that corrugated paper may have a practical value as a banding material, and that tarred paper, corrugated paper, and a tough crepe paper appear to be more effective than burlap. There is need of further tests of different materials, as well as a study of the reactions and behaviour of the mature larvae while in search of cocooning quarters.

CORY (E. N.) & MCDONNELL (H. B.). **Preliminary Tests of Ozone as an Insecticide.**—*J. Econ. Ent.*, xxi, no. 3, p. 510. Geneva, N.Y., June 1928.

In experiments, exposures ranging from 25 sec. to 5 minutes to a continuous flow of ozone in air at a concentration of 5 mgs. per litre showed a decided lethal action against adult insects, including houseflies, honeybees, flea-beetles and Aphids, placed in a desiccator.

COOK (W. C.). **A Note regarding Temperature Curves.**—*J. Econ. Ent.*, xxi, no. 3, pp. 510–511. Geneva, N.Y., June 1928.

The author calls attention to work by Matisse (Action de la Chaleur et du Froid sur l'Activité des Etres Vivantes, 556 pp. Paris, E. Larose, 1919) in which a three-dimensioned diagram is used to show the relation between time and temperature and the rate of movement of certain lower organisms. This diagram differs from one previously noticed [*R.A.E.*, A, xvi, 262] in that the highest rate comes near the moment of exposure to high temperature and the rate decreases exponentially with time. In the case of CO_2 production the rate increased for several hours and then decreased. The equation found by Matisse for the relation of temperature to rate of movement seems of fundamental importance; it is reproduced in its simplest form, but as the mathematics of fitting are too long for reproduction, reference is made to the original memoir for the use of the curve.

DARROW (G. M.). **Naphthalene Control of Red Spider and other Insects on Miscellaneous Crops in U.S. Department of Agriculture Greenhouses.**—*J. Econ. Ent.*, xxi, no. 3, p. 511, 1 ref. Geneva, N.Y., June 1928.

Four naphthalene vapour night fumigations at one to several days intervals, carried out according to a method previously noticed [*R.A.E.*, A, xiv, 656], but with concentrations ranging from one to three times that recommended, entirely controlled red spider [*Tetranychus*] on strawberries, killing eggs as well as adults. The treatment also killed ants and Aphids above ground, as well as adults of the whitefly [*Trialeurodes vaporariorum*, Westw.], and some, but not all, mealybugs. Fumigation was begun between 4 and 4.30 p.m. with lamps set to run about 6 hours, and the house was reopened at daylight next morning. Humidity varied from about saturation to 80 per cent., and temperature ranged between 70° and 86° F. Little or no injury was apparent on strawberries even when a concentration of 1 lb. to 3,500 cu. ft. was used; and in general injury to other plants was slight. Care should be taken to prevent the naphthalene from igniting, as the fumes cause severe injury to strawberry plants.

FLANDERS (S. E.). **Developments in *Trichogramma* Production.**—*J. Econ. Ent.*, xxi, no. 3, p. 512. Geneva, N.Y., June 1928.

The author describes improvements in the original method of rearing *Trichogramma minutum*, Riley [on *Sitotroga cerealella*, Ol.] for the control of the sugar-cane borer [*Diatraea saccharalis*, F.] already noticed [*R.A.E.*, A, xvi, 508], by means of which a daily production of over 200,000 parasites was maintained throughout July 1927.

Spray Recommendations for Codling Moth Control, Washington, for 1928.—*J. Econ. Ent.*, xxi, no. 3, pp. 512–514. Geneva, N.Y., June 1928.

Recommendations based on experimental work and practical results secured in commercial orchards are laid down for the control of the codling moth [*Cydia pomonella*, L.] in 1928 in Washington. Lead arsenate is the only insecticide recommended, a strength of 1 lb. to 50 U.S. gals. water being usually sufficient. Oil in combination with lead arsenate, though effective, is not recommended, on account of possible injury to foliage, while oil alone is not so effective as lead arsenate. Nicotine sulphate and other insecticides should only be used for experimental purposes. Attention should be chiefly directed toward the elimination of the first brood; the calyx spray should be applied before the calyx lobes have closed. Cover sprays should be timed by means of moth traps placed well up in the trees, and temperature records should be taken as soon as the first moths are caught, as the eggs will be laid as soon as the temperature reaches 60° F. at dusk. The first cover spray should be applied 10–12 days later, and in severely infested orchards cover sprays should be applied every ten days, though one or two applications may suffice in high altitudes or isolated orchards having slight infestation. Cover sprays for first brood larvae may be discontinued 10 days after the last moths are found in the traps. If there is an average of 3–5 larvae to each tree by 1st July, or if moth traps show an increase in the number caught after that date, one or more sprays for the second brood should be applied. The necessity for thorough spraying is emphasised, special attention being directed to the tops of the trees where most of the eggs are laid. Supplementary treatment recommended includes the destruction of all overwintering larvae in warehouses, etc., and the fumigation of boxes in sheds that cannot be tightly closed during the spring and summer to imprison the moths; scraping the rough bark from the trees to a depth of 1 or 2 inches below the ground and burning the overwintering larvae found beneath it; placing moth traps well up in the trees just before the application of the calyx spray to catch moths before the eggs are laid; banding trees on 1st June with subsequent examination at 10-day intervals; and thinning of fruit to break clusters and remove infested fruit, which should be destroyed and not buried.

PORTER (B. A.). **The Apple Maggot.**—*Tech. Bull. U.S. Dept. Agric.*, no. 66, 48 pp., 2 pls., 7 figs., 48 refs. Washington, D.C., May 1928.

The following is taken from the author's summary: *Rhagoletis pomonella*, Walsh (apple maggot), a native American Trypetid formerly attacking only native fruits, principally hawthorn, has during the past 75 years become a major pest of cultivated apple in the north-eastern United States and south-eastern Canada. Pears, plums and possibly cherries are also attacked, and in certain localities blueberries and huckleberries [*R.A.E.*, A, xii, 7]. Although flies reared from different food-plants are indistinguishable, it appears that flies from one of them do not normally attack another unless the two fruits are closely similar. Slight injury is caused by the adult in ovipositing, but the feeding of the larvae within the fruit occasions the most serious damage, complete honeycombing resulting from the presence of several larvae in one apple. A table is given showing the extreme differences in susceptibility among the different varieties of apple. None appears to be entirely immune, but those most severely injured are among sweet or mildly acid fruit, chiefly summer and autumn varieties. *R. pomonella* hibernates in the ground in the pupal stage. The adults emerge in Connecticut from mid-June to early July, emergence continuing for 5 weeks or more and being completed by early August. Early fruit is first attacked, partly because it is attractive earlier in the season and partly because flies from material under trees bearing such fruit emerge earlier. Oviposition begins about a week after emergence. The eggs are inserted into the apples just under the skin, and the larvae hatch in 2 to 9 days and tunnel through the apple. The larval period varies from 2 weeks in early maturing varieties to several months in hard winter apples. A high mortality, often reaching 100 per cent. in hard winter fruit, occurs in the larval stage. The larvae, very few of which mature before the fruit has fallen, leave the apple and enter the ground to pupate. In southern localities a few flies emerge the same season, but so late that not many are able to find fruit for oviposition, and few of the larvae hatching from such eggs are able to reach maturity. The majority of the flies emerge the following summer, but some may remain in the pupal stage until the second summer.

Several predacious enemies have been recorded, but these are probably only occasional. One egg parasite, *Anaphoidea conotracheli*, Gir., and two larval parasites, *Opius melleus*, Gah., and *O. ferrugineus*, Gah., have also been recorded, but neither parasites nor predators appear of much value.

Satisfactory control was secured with two applications of lead arsenate, 1–1½ lb. to 50 U.S. gals. water, to which a casein-lime spreader may be added. The first application is made in southern Connecticut about 25th June for early apples and early in July for autumn or winter fruit, and the second about 2–3 weeks later. All trees of all varieties should be sprayed at the first application, including those not susceptible or not bearing a crop. Fallen infested fruit should be removed before the larvae can leave it.

KNOWLTON (G. F.). **The Beet Leafhopper in Utah.**—*Bull. Utah Agric. Expt. Sta.*, no. 205, 23 pp., 11 figs., 1 ref. Logan, Utah, June 1928.

Much of this information on *Eutettix tenella*, Baker (beet leafhopper) and curly-top of sugar-beet in Utah has already been noticed from a shorter paper [*R.A.E.*, A, xvi, 213]. Nymphs are most numerous in spring and late autumn. Some hibernate, but it is doubtful if they survive the winter. Saltbushes [*Atriplex*] are among the important local food-plants, a list of which is given. At certain seasons when most of their preferred food-plants dry up, the insects die if they cannot find a suitable substitute within a short time.

SORENSON (C. J.). **Treehopper Injury in Utah Orchards.**—*Bull. Utah Agric. Expt. Sta.*, no. 206, 18 pp., 8 figs., 6 refs. Logan, Utah, June 1928.

Of recent years, various species of treehoppers have been injuring fruit trees in autumn in the orchard districts of Utah. Of 788 specimens collected, 65 per cent. were *Ceresa bubalus*, F., and 31 per cent. *Stictocephala gillettei*, Goding, the remainder consisting of *S. inermis*, F., *S. pacifica*, Van D., and *C. basalis*, Wlk. A general description of these and of the life-history of *C. bubalus* is given. *Campylenchia latipes*, Say, and *Publilia modesta*, Uhl., were also abundant, but are not known to feed or oviposit on fruit trees.

The females cut slits for oviposition about ¼ in. long in the bark of fruit trees one or two years old, or in that of the young branches of older ones. Apple, pear and peach are preferred. Two parallel egg-pockets about ⅙ to ⅛ in. apart are usually made by *C. bubalus*, which may appear as a single scar after two or three years. From these cuts there is a loss of sap; this is particularly noticeable in stone-fruit trees, especially young ones. Injured trees become scarred, deformed and unthrifty. Those that are 6 or 8 years old seem to outgrow the injury, but a heavy infestation reduces their yield. The orchards most affected, particularly young ones, are those where lucerne, sweet clover or weeds occur, as the insects in the nymphal stage feed on these plants and then move to the trees to oviposit. The eggs hatch in April, and the adult stage is usually reached during July, oviposition beginning in August.

The attacks of these insects on orchards may be prevented by clean cultivation or by growing crops between the fruit trees that are not attractive to them, such as strawberries, raspberries, squash and cereals. Early pruning eliminates some of the infested twigs. Some measure of control may be obtained in older orchards with dormant miscible oil sprays, if the severity of the attack justifies the expense. The spraying of apple trees with regular dormant oil spray specially for the control of the fruit-tree leaf-roller [*Tortrix argyrospila*, Wlk.] killed 50 per cent. of the treehopper eggs. In a heavy attack, partial control would be effected by adding nicotine sulphate to the regular calyx spray of lead arsenate, as the eggs are usually hatching at this time. Six per cent. of the eggs of *C. bubalus* were found to be parasitised by a Chalcid, *Polynema striaticorne*, Gir.

Magill (W. W.) & Olney (A. J.). **The Peach Borer and Paradichlorobenzene Treatment.**—*Ext. Circ. Coll. Agric. Kentucky*, no. 159 (revised), 4 pp., 2 figs. Lexington, Ky., April 1928.

This information concerning the application of paradichlorobenzene in the control of *Aegeria exitiosa*, Say (peach borer) in Kentucky is similar to that given for Georgia [*R.A.E.*, A, xvi, 454]. For peach trees three to five years old ½ to 1 oz. of the crystals should be used per tree, and 1 to 1½ oz. for each tree six years old or more. The most suitable time for applying paradichlorobenzene in Kentucky is the first half of September.

Young trees are not injured provided that care is taken to weigh the necessary amount of insecticide accurately and to remove the mounds after four weeks, replacing fresh earth to avoid injury to the exposed bark in the winter. The dose is ⅛ oz. for trees one year old, and ⅜ oz. for those two years old. Spring treatment with this insecticide is not effective; digging out the borer with a knife is then better.

Davis (A. C.). **A Note on the Parasitism of** *Hippodamia*.—*Pan-Pacific Ent.*, iv, no. 4, p. 184. San Francisco, Cal., April 1928.

It has been observed that *Dinocampus coccinellae*, Schr., a parasite of Coccinellids, fastens its host to a leaf with its cocoon, and although the ladybird cannot get away, it may live for several days. A parasitised individual of *Hippodamia convergens* var. *ambigua*, Lec., separated from the parasite cocoon, returned to it and and settled on it, remaining motionless; this observation was repeated several times. At the end of 24 hrs., the beetle was given Aphids, some of which were eaten, and after this it did not again attach itself to the parasite's cocoon. It survived eight days. From this it would appear that the captivity of the parasitised ladybird may, in some cases, be voluntary.

Essig (E. O.). [**An Outbreak of** *Halisidota argentata*, **Pack.**]—*Pan-Pacific Ent.*, iv, no. 4, p. 186. San Francisco, Cal., April 1928.

A severe local outbreak of *Halisidota argentata*, Pack., occurred in California early in 1928, the larvae chiefly attacking Douglas fir (*Pseudotsuga taxifolia*) and defoliating the young trees. They were practically full-grown on 1st April.

Charles (V. K.) & Popenoe (C. H.). **Some Mushroom Diseases and their Carriers.**—*Circ. U.S. Dept. Agric.*, no. 27, 9 pp., 1 fig., 2 refs. Washington, D.C., February 1928.

An account is given of two fungous diseases of mushrooms, bubbles disease, which is due to a species of *Mycogone*, and plaster-mould disease, and of measures for controlling the former, including the use of disinfectants and fumigation with formaldehyde or sulphur. No satisfactory method of control has yet been found for plaster-mould disease. Insects, such as the flies and Collembola that attack mushrooms [*cf. R.A.E.*, A, v, 423] and the flies that breed in compost, are among the agencies by which the spores of these fungi are spread. Doors and ventilator shafts should therefore be screened and the houses fumigated for their control. For this purpose nicotine may be used, either dusted through the house or evaporated from commercial solutions or nicotine paper. Free nicotine is preferable to nicotine sulphate solutions, since the latter are less volatile, and the soap generally used to release the free nicotine from them is injurious to mushrooms, though air-slaked or hydrated lime at the rate of 1 lb. to 50 U.S. gals. nicotine sulphate may be substituted. Hydrocyanic acid gas may also be applied ; calcium cyanide at the rate of 1 lb. to 1,000 cu. ft. may be used at the time of maximum heat before spawning, when the insects are driven out of the compost in the bed by the heat generated by the manure, which at times reaches 150° F. One fumigation at this time will be found effective in destroying the majority of insects carried into the house in the compost. Fumigation with light doses of calcium cyanide 2–3 times a week over a period of 2 weeks, and the use of a maximum of 3 oz. sodium or calcium cyanide to 1,000 cu. ft. space after the gathering of every crop while the atmosphere of the house is comparatively dry are also recommended. Fumigation should be carried out at a rising temperature in houses containing growing mushrooms, as the moisture deposited otherwise may cause serious burning and spotting of the caps. The margin of safety between a dose of 3 oz. to 1,000 cu. ft. space, which will give effective control, and an amount that will damage the crop is very small ; tests should therefore be made to find the minimum quantity between $\frac{1}{2}$ oz. and 3 oz. An application by dusting or burning of pyrethrum at the rate of 1 lb. to 1,000 cu. ft. every alternate day for a fortnight is also recommended as safe and reasonably satisfactory.

MARCOVITCH (S.). **Studies on Toxicity of Fluorine Compounds.**—*Bull. Tennessee Agric. Expt. Sta.*, no. 139, 48 pp., 8 figs., 89 refs. Knoxville, Tenn., March 1928.

This is a detailed account of experiments with fluorine compounds, some of which, including the author's conclusions, have already been noticed [*R.A.E.*, A, xvi, 393]. As a substitute for arsenicals, fluosilicates appear to be the best protection for plants against phytophagous insects, and have given good results against *Epilachna corrupta*, Muls., *Diabrotica vittata*, F., *Leptinotarsa decemlineata*, Say, *Anthonomus grandis*, Boh., *Epicauta* sp., *Diatraea saccharalis*, F., and *Feltia ducens*, Wlk., as well as various fleabeetles, biting lice and grasshoppers. Dry dusts of sodium fluosilicate and sulphur were more effective than dusts in the presence of moisture against adults of *E. corrupta* ; dew caused the powder to adhere to the plants and resulted in some injury to foliage. Fluorine compounds do not repel insects as arsenicals do, and in soluble form are less injurious to plants than soluble arsenicals ; when moisture is present, sulphur or flour is safer than lime as a carrier, used at the rate of 2 parts to 1 of sodium fluosilicate. Oxalates, barium carbonate, and a 2 per cent. solution of barium chloride were ineffective in field tests against *L. decemlineata*. Sodium fluosilicate in poison baits is slightly more toxic to grasshoppers than sodium arsenite. Both arsenicals and fluorine compounds are much more effective at high temperatures, especially above 100° F.

Roark (R. C.) & Cotton (R. T.), U.S. Bur. Ent. **Insecticidal Action of some Esters of Halogenated Fatty Acids in the Vapor Phase.**—*Indust. Engng. Chem.*, xx, no. 5, p. 512 *et seq.* (reprint 5 pp.). [Easton, Pa.] May 1928.

The following is the authors' summary: From the standpoints of toxicity to insects, availability, cost, and freedom from fire hazard, methyl, isopropyl, and ethyl monochloroacetates appear to be the most promising of the lower alkyl esters of chloroformic (chlorocarbonic), monochloro-, dichloro-, and trichloroacetic, monobromoacetic, α-bromo- and β-bromopropionic and β-chloropropionic acids tested. Dosages of 1 lb. methyl monochloroacetate, 1·5 lb. isopropyl monochloroacetate, and 2 lb. ethyl monochloroacetate per 1,000 cu. ft. are effective against stored-product insects in fumigation vaults of the commercial type. Unfortunately, the monochloroacetates injure the germination of wheat; hence they do not look promising for the fumigation of grain intended for seed.

Canada: **Destructive Insect and Pest Act. Regulations: no. 3 (Foreign), 4th Revision; no. 11 (Foreign), 3rd Revision; no. 14 (Foreign), 4th Revision; no. 16 (Foreign); no. 17 (Foreign).**—Ottawa, April 1928.

These revisions and new regulations, which are effective on and after 12th April 1928, are here dealt with in the same order as in the title, each receiving a separate paragraph.

The regulation against the introduction of the potato tuber moth [*Phthorimaea operculella*, Zell.] and wart disease [*R.A.E.*, A, xv, 381] is revised to permit the importation of potatoes from California if these have been fumigated for 75 minutes in 20 in. mercurial vacuum with 28 lb. carbon bisulphide and carbon dioxide in combination to 1,000 cu. ft. space and have not been exposed to re-infestation.

By additions to the regulation against the introduction of *Hypera variabilis*, Hbst. (*Phytonomus posticus*, Gyll.) (alfalfa weevil) into Canada [*loc. cit.*], the importation of lucerne hay from California is only prohibited as regards certain counties; shipments of lucerne meal from the quarantined areas may only be made if these are accompanied by a certificate stating that the meal has been ground in, and shipped from, an area known to be free from the weevil and prepared from hay grown in an uninfested area.

The area covered by the regulation to prevent the introduction of the Oriental peach moth [*Cydia molesta*, Busck] and peach yellows into British Columbia [*R.A.E.*, A, xv, 584] is extended to include Wisconsin, Illinois, Missouri, Arkansas and Texas, and all States to the east of these.

The importation into Canada of trees and shrubs from European countries other than the British Isles is prohibited, unless accompanied by a certificate stating that they have been grown in a district known to be free from infestation by *Lymantria* (*Liparis*) *monacha*, L.

Canada: **The Destructive Insect and Pest Act and Regulations thereunder. Acts, Orders and Regulations, no. 8.**—2nd revd. edn., 29 pp. Ottawa, July 1928.

This revised edition brings up to date the Regulations under the Destructive Insect and Pest Act, some of which are noticed above, and includes among those not previously noticed a number of domestic regulations and the 5th Revision of Regulation no. 10, which provides against the introduction of the European corn borer [*Pyrausta nubilalis*, Hb.]. It forbids the importation of maize, broom corn, including all parts of the plant, all sorghums and sudan grass from Connecticut, Indiana, Maine, Massachusetts, Michigan, New Hampshire, New York, Ohio, Rhode Island, Vermont and West Virginia ; and of cut flowers and entire plants of chrysanthemum, aster, cosmos, zinnia and hollyhock and of gladiolus and dahlia except the corms and roots without stems, oat and rye straw, as such, or when used for packing, celery, green beans in the pod, beets with tops, and rhubarb, from the States of Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island and Vermont, during the period from 1st June to 31st December, unless accompanied by a certificate stating that the shipment is free from infestation by *P. nubilalis* ; broom corn for manufacturing, clean shelled maize and clean seed of broom corn may be imported from any of the States listed if accompanied by such a certificate.

WATSON (E. B.). **The Bionomics of the Spruce Bark-beetle** (*Dendroctonus piceaperda*, **Hopk.**).—*Sci. Agric.*, viii, no. 10, pp. 613-631, 4 pls., 2 figs. Ottawa, June 1928.

Dendroctonus piceaperda, Hopk. (eastern spruce bark-beetle), which is widely distributed in the coniferous forests of Eastern Canada, is a potential source of danger to white spruce stands. Near Frater, Ontario, on the shores of Lake Superior, it breeds exclusively in white spruce (*Picea canadensis*), no particular preference being shown for the larger trees. Black spruce (*P. mariana*) is totally immune. This Scolytid, when appearing in numbers too great to be accommodated by the usual supplies of fallen timber in a forest, will attack green, standing trees. At Frater, the first and largest flight takes place in June, under favourable conditions, maximum emergence occurring in the first ten days ; the beetles concentrate mostly on the lower parts of the trunks of standing trees, usually not more than 25 ft. from the ground. The second flight, occurring from towards the end of July to the first week of August, is generally on a smaller scale. It is composed of hibernated young beetles cutting a second set of tunnels and adults from overwintered mature larvae. The August flight of beetles affects the tops of the trees above the June infestation. Their progeny hibernates as small larvae, which develop in the following spring and become adult in July or August, not emerging from the trees till the following year. The offspring of the June flight hibernate either as young beetles or as mature larvae. The former fly in the following June ; whilst the latter complete their metamorphosis in spring, the adults flying in July or August.

Many of the observations on the bionomics of this Scolytid were made by caging the lower trunk of a standing tree, the basal 20 ft. at most, the method being described and figured.

Ips perturbatus, Eich., and *Polygraphus rufipennis*, Kby., the only secondary bark-beetles at Frater sufficiently numerous to become potential enemies of spruce, were found to be of no economic importance in this district. The former attacked spruce only in the year following an infestation by *D. piceaperda*, whereas the latter was found in the current year as well. *I. perturbatus* always hibernates in the adult stage and flies at the end of May. Sometimes a second set of tunnels is cut, the resulting brood rapidly becoming adult before winter.

Pupation in the first brood takes place in July, but the resulting adults do not infest fresh spruce till the spring. Trunks and tops of trees above an infestation by *Dendroctonus* are preferred. Hibernation occurs in the ground, in pieces of decaying wood, under moss, dead leaves, etc.

The parasites of *D. piceaperda* include *Cerobracon secundus*, Dalla Torre, and the Dolichopodid, *Medetera vanduzeei*, Curr.; their effect appears to be negligible. Predacious Clerids were numerically unimportant. Various species of woodpeckers, apparently attracted from outlying districts by an infestation, destroy enormous numbers of larvae and adults, preferably those in standing timber and of the June progeny, especially in winter. The offspring of the August flight is attacked in the adult stage in the second winter. Windfalls lying prone on the ground are ignored by the birds. In those raised about four or five feet 50–60 per cent. of the insects are eaten and in standing trees 98·5 per cent. are thus destroyed in winter.

Examples showed that the reaction of spruce to a bark-beetle attack by a heavy exudation of resin is very variable; the intensity of resin-flow can be as high for a fast-growing tree as for a slow-growing one. Comparisons of the radial growth of healthy spruce and beetle-killed trees showed the insects to exhibit a preference for the slow-growing tree. Details concerning the number of beetles necessary to kill a tree are given, as well as figures illustrating the more important points connected with the growth of healthy and beetle-killed trees. Large trap-trees felled in winter or spring are recommended for control purposes in districts where the pest is most prevalent. Girdled spruce when left standing or even felled trees supported at a slope are ignored by *D. piceaperda*.

MITCHENER (A. V.). **On the Effect of the Wheat-stem Sawfly,** *Cephus cinctus* **Nort., upon the Spring Wheat Crop in Western Canada.**—*Sci. Agric.*, viii, no. 12, pp. 751–756, 7 refs. Ottawa, August 1928.

The economic importance of *Cephus cinctus*, Nort., in Manitoba, Saskatchewan and Alberta is almost entirely due to its attacks upon spring wheat, and to a less extent upon spring rye. Great losses are sustained annually.

The larvae hibernate in a protective membrane within the hollow bases of the plant stems below the surface of the ground. Pupation occurs in May, the adults emerging before the middle of June. The females, which very greatly outnumber the males in the field, soon begin to oviposit within the hollow stems below the top nodes; each lays about 50 eggs. The young larvae feed upon the tissue lining the stems, moving downward as they grow and cutting their way through each node. As the plant approaches maturity, the larva cuts a ring around the inside of the straw near the level of the ground and then goes below this to hibernate. Stems thus ringed are readily blown flat out of the reach of harvesting machinery. Infested standing stems on being split open can be identified by the presence of larval castings.

Investigations, completed in 1927, were undertaken for four separate years to determine the effect of infestation on the grain. The percentage of infested plants averaged 33·7 for the four years in the case of the *vulgare* variety of wheat, and 19·3 in the case of the *durum* variety. There was, however, a decrease in the severity of sawfly infestation each year. This is considered to be due partly to modifications in the cropping practices in the area, there being a great increase both in the percentage of *durum* wheat grown and in the acreage devoted to the cultivation of sweet clover. The presence of this sawfly does not materially affect the weight of the grains of either variety of wheat.

Loss of yield in an infested area is due largely to fallen stems. It is therefore suggested that the cutting of the crop should be completed before it becomes dead ripe, when the larvae are about to ring the bases of the straws. This is also the time considered by other investigators to be the most opportune for obtaining the greatest yields and the finest sample of wheat.

CAESAR (L.). **The European Corn Borer.**—*Bull. Ont. Dept. Agric.*, no. 334, 16 pp., 14 figs. Guelph [Ont.], March 1928.

This popular account of the European corn borer [*Pyrausta nubilalis*, Hb.] in Canada includes a brief life-history and summary of control measures and legislation.

D[AMPF] (A.). **Una nueva plaga del cacao.** [A new Pest of Cacao.]—*Bol. mens. Defensa agríc. Sec. Agric. Fom. México*, ii, no. 1–3, p. 14. S. Jacinto, D.F., January–March 1928.

Larvae, pupae and adults of the Scolytid, *Stephanoderes guatemalensis*, Hopkins, have been found in cacao pods attacked by cacao black rot (*Lasiodiplodia theobromae*) in the State of Oaxaca, Mexico. Only the envelopes are mined. Probably only fallen or stored pods are attacked by this beetle, which hitherto has been known only from Guatemala.

Informe general de las actividades de la Oficina para la Defensa agricola, durante el año de 1927.—*Bol. mens. Defensa agríc. Sec. Agric. Fom. México*, ii, no. 1–3, pp. 21–88. S. Jacinto, D.F., January–March 1928.

This report includes a list of the pests reported in the various States in 1927.

FAWCETT (G. I.). **El encrespamiento de las hojas de la Remolacha y el insecto transmisor.** [Curly-leaf of Beet and the Insect Vector.]—*Rev. ind. agríc. Tucumán*, xviii, no. 5–6, pp. 61–66, 1 fig. Buenos Aires, October–November 1927.

The results of experiments in the transmission of curly-top of beets by *Agallia sticticollis*, Stål [*R.A.E.*, A, xv, 458], which are described in detail, together with the absence of *Eutettix tenella*, Baker, from Argentina, are regarded as conclusive proof that the former is the vector of the disease in Tucumán.

Circular of Information concerning the Plant Inspection and Quarantine Service.—*Hawaii. For. & Agric.*, xxv, no. 1, pp. 1–32. Honolulu, January–March 1928.

This is a review of legislation against the introduction and spread of plant pests in the territory of Hawaii. The regulations of the Board of Commissioners of Agriculture and Forestry concerning the control of insects and plant diseases are also given, and an appendix contains notes on plant inspection as practised in countries directly connected with Hawaii by steamship, *viz.*, Australia, New Zealand, Canada, Japan and the Philippines.

HEINRICH (C.), U.S. Bur. Ent. **A new Apple Moth from Manchuria (Lepidoptera: Olethreutidae).**—*Proc. Ent. Soc. Wash.*, xxx, no. 5, pp. 91–92, 2 figs. Washington, D.C., May 1928.

Cydia (*Grapholitha*) *inopinata*, sp. n., a serious pest of the fruit of apple and *Crataegus*, is described from South Manchuria.

LEEFMANS (S.). **Voorlopige mededeeling in zake** *Brachartona catoxantha*, **Hamps., benevens aanwijzingen tot de bestrijding dezer plaag.** [A preliminary Communication on *Artona catoxantha*, with Instructions for combating this Pest.]—*Korte Meded. Inst. PlZiekt.*, no. 7, 19 pp., 6 figs. Buitenzorg, 1928. (With a Summary in English.)

The Zygaenid, *Artona* (*Brachartona*) *catoxantha*, Hamps., is a serious pest of coconut in Sumatra and in the west, and particularly the centre, of Java; it is not definitely known to occur in Celebes. The egg stage lasts 4 days, the larval stage 17–22 and the pupal stage 10–12, a generation requiring 29–36 days at the altitude of Buitenzorg. Owing to variations in the development of different individuals, larvae, pupae and adults can sometimes be found at the same time.

In order of importance the most valuable parasites in Java are the Tachinid, *Degeeria albiceps*, Macq., ; the Braconid, *Apanteles brachartonae*, Rohw.; the Tachinid, *Ptychomyia remota*, Aldr.; the Eulophid, *Euplectrus* sp.; and an Ichneumonid. *D. albiceps* oviposits in larvae 6–14 days old and develops in 17–24 days. The pupal case remains enclosed in the skin of the host larva. The maximum life in captivity was 29 days. *A. brachartonae* chiefly parasitises young larvae and develops in 12–17 days, captive adults living up to 27 days. *P. remota* develops in 13–34 days, development being quicker in large larvae. *Euplectrus* sp. deposits its eggs in batches on the host larva. Its larvae are ectoparasitic and pupate on the empty skin of the host, which is able to spin a cocoon before dying. Development takes 17–19 days, and captive adults lived up to 21 days. The Ichneumonid is an ectoparasite of the pupa, and perhaps of the prepupa, and pupates on the host cocoon, development lasting 13–18 days and adult life in captivity 32 days. Another parasite, *Eurytoma* sp., oviposits in the cocoon of *A. catoxantha*, in which it pupates, development lasting 18 days; the maximum life in captivity was 43 days. *Anastatoidea brachartonae*, Gahan, of which only the female is known, is sometimes a primary parasite of *A. catoxantha*, but also attacks the two Tachinids, *Apanteles brachartonae* and the Ichneumonid. No egg-parasite of *A. catoxantha* has been found. Of all these only *Apanteles brachartonae* is able to keep pace with the rapid spread of *Artona catoxantha*.

As an infestation begins in a sharply defined centre, promptness in reporting its occurrence is essential for successful control. A measure that many years of experience has shown to be quite effective in preventing a spread of the moth or its recurrence consists in the cutting off and burning of the fronds of infested palms. If this is done when the largest larvae are about to pupate, the destruction of many individuals of *Apanteles brachartonae* will be avoided. The fronds must be cut on those trees that show more than five living larvae or cocoons to two fronds. The youngest closed frond and the three youngest just opened fronds are not cut off. Such treatment may be repeated after a year without danger to the palm. The immediate economic loss is greater than that caused by the pest, but its spread is prevented. The cutting must never be done while the adults are on the wing.

MATHUR (V. P.). *Tachardia lacca* **and** *Anona squamosa.—Indian Forester,* liv, no. 6, pp. 381–382. Allahabad, June 1928.

During the inspection of an area in the Central Provinces, where *Laccifer* (*Tachardia*) *lacca*, Kerr, had been propagated the previous winter on *Butea frondosa,* the Coccids were also found on adjacent teak and *Anona squamosa.* These trees had apparently been accidentally infested at the emergence of the previous winter brood, which was exceptionally large and possibly hardy enough to migrate some distance. Though there appears no likelihood of a good crop resulting from the chance infection of teak, the insects on *Anona* were in excellent condition and had passed all the critical stages, while the quality of the lac appeared better than that on *Butea.* Continued propagation on *Anona* for two or three generations is likely to produce a quality of lac equal, if not superior, to that on *Schleichera trijuga.*

WITHYCOMBE (R.). [**Termites attacking Rubber Cable Insulation.**]—*Ann. Rep. Electr., Rly. & Wireless Dept., Zanzibar Prot. 1927,* p. 1. Zanzibar, 1928.

The insulation of the electric wiring system in three buildings in Zanzibar was found in 1927 to be attacked by termites. This is apparently the first recorded instance of termites attacking rubber-covered wires.

DELGADO DE TORRES (D.). **Experiencias sobre el modo de actuar de la nicotina en los insectos y su utilización en los invernaderos como insecticida.** [Experiments on the Action of Nicotine on Insects and its Use in Hothouses as an Insecticide.]—*Bol. Pat. veg. Ent. agric.,* ii, no. 8–9, pp. 113–120, 18 refs. Madrid, December 1927.

A brief survey is given of the methods of using nicotine against insects and of the various explanations advanced regarding its action, that by McIndoo [*R.A.E.*, A, v, 21] being considered the most satisfactory. The experiments in greenhouse fumigation here described were made in the United States. A dust containing 12·5 per cent. of nicotine proved the best of the tobacco products tried. Burnt at the rate of 0·215 gm. of pure nicotine per cubic metre, this dust killed the Aphid, *Macrosiphum samborni,* Gill, but was only partially satisfactory against *Heliothrips femoralis,* Reut., and *Trialeurodes vaporariorum,* Westw. The fatal dose for the thrips was twice that required for the Aphid. *Pseudococcus citri,* Risso, and larvae of Lepidoptera are very resistant to nicotine. The fumes of nicotine kill almost immediately after they are produced, and this enables fumigation to be curtailed. It is probable that they paralyse the nerve centres.

BENLLOCH (M.). **La "arañuela" de los cultivos de huerta y árboles frutales** (*Tetranychus telarius*, **L.**). [The "Red Spider" of Vegetable Gardens and Fruit Trees.]—*Bol. Pat. veg. Ent. agríc.*, ii, no. 8–9, pp. 155–159, 3 figs. Madrid, December 1927.

Tetranychus telarius, L., does considerable injury in Spain in summer. In vegetable gardens a sulphur spray should be used, or one of 3½–4 lb. liver of sulphur to 100 gals. water. For orchards a solution containing 4–5 parts of the Savastano lime-sulphur mixture [see below] in water to make 100 parts may be used. Even better results are obtained with a 1 per cent. neutral mineral oil emulsion.

DEL CAÑIZO (J.). **Preparación de la mixtura sulfocalcica.** [The Preparation of Lime-sulphur Mixture.]—*Bol. Pat. veg. Ent. agríc.*, ii, no. 8–9, pp. 159–162. Madrid, December 1927.

The formula for preparing Savastano lime-sulphur mixture [*R.A.E.*, A, ii, 412] is slightly modified, only 20 parts by weight of sulphur being now used with 10 of quick-lime and 100 of water.

Trabajos de las estaciones de fitopatología agrícola. [Work done by the Stations of agricultural Phytopathology in Spain.]—*Bol. Pat. veg. Ent. agríc.*, ii, no. 8–9, pp. 163–181. Madrid, December 1927.

The larvae of a Bombyliid, *Mulio infuscatus*, Mg., are recorded as infesting the egg-pods of *Dociostaurus maroccanus*, Thunb. *Chaetocnema tibialis*, Illig., is an important pest of beet, which is also attacked by other Halticids, such as *Haltica oleracea*, L., and *Phyllotreta nemorum*, L. In the course of an outbreak on oaks of *Catocala nymphaea*, Esp., and an unidentified Geometrid, a great increase of the predacious Sphegid, *Psammophila ariasi*, Mercet, was observed. A 5 per cent. solution of methylated spirits gave good results experimentally against *Eriosoma lanigerum*, Hausm. The acclimatisation and distribution of its parasite, *Aphelinus mali*, Hald., has proceeded satisfactorily, and the same may be said of the Coccinellid, *Novius cardinalis*, Muls., introduced against *Icerya purchasi*, Mask. Grapes in Almeria are attacked by Ortalid flies as well as by *Ceratitis capitata*, Wied. *Pyrausta nubilalis*, Hb., only causes serious injury to late-sown maize. Serious damage to lucerne in Valencia has been caused by the Tineid, *Nothris lotellus*, Const., and the Pyralid, *Phlyctaenodes sticticalis*, L. *Vesperus xatarti*, Muls., a pest of vine-roots, has been noticed attacking the roots of orange and olive.

Trabajos de las secciones agronómicas relativos á plagas del campo en el año 1927. [Work done against Plant Pests by the agronomical Sections in 1927.]—*Bol. Pat. veg. Ent. agríc.*, ii, no. 8–9, pp. 181–198. Madrid, December 1927.

A list is given of the various pests regarding which advice was sought in 1927 from the phytopathological stations in Spain and the Balearic and Canary Islands.

POLIZU (S.). **Molia merelor şi combaterea ei.** [*Cydia pomonella*, L., and its Control.]—*Viata agricola*, 1928, no. 1–2, pp. 26–30, 4 figs. Bucharest, January 1928.

A description is given of both sexes of *Cydia pomonella*, L., and the results of counts of larvae made in Bessarabia during 1920–27 under trap bands and on different varieties of apple trees are discussed. Recommendations are also made for control.

VEREŞCEAGHIN (B.). **Duşmanii viilor din Basarabia.** [Vine Pests in Bessarabia.]—*Viata agricola*, 1928, no. 12, pp. 373–380. Bucharest, June 1928.

This is a brief account of the vine pests observed in Bessarabia during the period 1913–28, with notes on their biology and control.

POLIZU (S.). **Duşmanii floarei soarelui.** [Pests of Sunflowers.]—*Bul. Camer. Agric.*, 1928, no. 1, pp. 7–12. Kishinev, January 1928.

An account is given of the pests attacking sunflower in northern Bessarabia, with recommendations for their control. The insects dealt with are *Agapanthia dahlii*, Richt., *Mordellistena parvula*, Gyll., *Lygus pratensis*, L., *Dolycoris* (*Mormidea*) *baccarum*, L., *Pyrausta nubilalis*, Hb., *Euxoa* (*Agrotis*) *segetum*, Schiff., *Brotolomia meticulosa*, L., *Homoeosoma nebulella*, Hb., and *Heliothis scutosa*, Schiff.

NÉMETH (A.). **Neue Versuche zur Maiszünslerbekämpfung.** [New Experiments in combating the Maize Pyralid.]—*Fortschr. Landw.*, iii, no. 11, pp. 493–499. Vienna, 1st June 1928.

The cobs on maize plants infested by *Pyrausta* (*Botys*) *nubilalis*, Hb., yield less weight of grain even though they themselves have not been attacked. In severe cases 40–50 per cent. of the crop may be lost. Infestation in the stem produces a forced ripening of the cob, and in observations in Czechoslovakia 95 per cent. of the cobs that ripened 10–14 days before the normal date were found to be from infested plants.

About 30 years ago Czerháti advocated the cutting off and removal of the male panicles and their use as green fodder. The value of this measure has since been questioned, but the author's observations in 1925–27 confirm it. He removed the male panicles and the topmost leaf or two leaves in each second row of plants in experimental plots. At the flowering time of an early ripening variety of maize, at least 50–70 per cent. of the larvae are either in the two top joints of the stem or at the foot of the two top leaf-sheaths or even in the male panicle, the remainder infesting some part of the plant below. Though it is possible that more eggs are being laid at this time, the flight of the moth begins before the flowering of the male panicles of the earliest varieties of maize, and the removal, at the beginning of the flowering period or a few days before, of the male panicle and the uppermost two leaves of early ripening maize enables 65–75 per cent. of the larvae to be destroyed. Only about 50 per cent. remain at the top of the plant 8–10 days after the beginning of flowering, and only 20–25 per cent. 8–10 days later. The removal of 50 per cent. of the male panicles before flowering or at its beginning does not affect fertilisation, nor does the removal 8 days later of a further 25 per cent. At the time of a later, third, removal the maize has already flowered. The material cut off must be taken away at once and used as fodder, the value of which counterbalances the cost of the work. About half the larvae in the field can be destroyed by this measure as practised in three stages. Later on the usual methods of dealing with the maize straw and stems must be applied in order to destroy the remainder of the larvae.

Faes (H.). **Influence des conditions climatériques sur le développement des insectes et champignons parasites des cultures.**—*Annu. agric. Suisse,* xxix, fasc. 2, pp. 221–228, 2 refs. Berne, 1928.

Observations on the influence of varying climatic conditions on the more important insects and fungi infesting crops have been made at the Federal Viticultural Experiment Station, Lausanne, since its foundation in 1886. The author gives a summary of these observations on four important vine pests, which include *Phylloxera vastatrix,* Planch., and *Clysia* (*Cochylis*) *ambiguella,* Hb. Statistics indicate that the spread of *P. vastatrix* is favoured by hot, dry summers that dry the upper layers of soil and induce extensive migrations of the young Aphids. On the other hand *C. ambiguella,* which originated in temperate regions, cannot easily withstand great heat or dryness, the eggs and young larvae being particularly susceptible to desiccation. This moth, therefore, causes more damage when the spring is damp and cool, particularly when the flowering of the vines is poor and abnormally prolonged. In hot dry years little damage will be done, especially if the periods of heat and dryness coincide with oviposition and the hatching of the caterpillars, which take place from the end of May to the beginning of June and from the end of July to the beginning of August.

Amtliche Pflanzenschutzbestimmungen. [Official Regulations on Plant Protection.]—*NachrBl. deuts. PflSchDienst,* Beilage ii, no. 1, pp. 1–44. Berlin, 1st June 1928.

This issue includes German regulations forbidding the use of lead compounds against vine pests, regulating greenhouse fumigation with calcium cyanide, requiring the occurrence of the beetle [*Niptus hololeucus,* Fald.] to be reported without delay, and regulating the sale of poisonous insecticides and fungicides.

Blunck (H.) & Hähne (H.). **Rübenaaskäfer und ihre Bekämpfung.** [Beet Silphid Beetles and their Control.]—*Flugbl. Biol. Reichsanst. Land- u. Forstw.,* no. 92, 4 pp., 6 figs. Berlin, March 1928.

Brief notes are given on the bionomics and control of the Silphids, *Blitophaga opaca,* L., and *B. undata,* Müll., which are primarily phytophagous and especially attack beet in Germany, and *Silpha obscura,* L., of which this is only true to a minor degree. *Phosphuga* (*Silpha*) *atrata,* L., feeds on snails and will not attack plants.

[Konakov (N. N.).] **Конаков (Н. Н.). Biological Observations on the Flight of Noctuids according to Data obtained from Molasses Baits at the Ramon Selection Station during 1926.** [*In Russian.*] —*Sbornik S.S.U.*, no. 2 (10), pp. 73–83, 15 refs. Kiev, S.S.U. Sakharotrest, 1927.

In experiments carried out in the Government of Voronezh baits of fermenting molasses were kept in the field from the 22nd April to 1st October. In the one pan 4,845 Noctuid moths were caught, representing 80 forms and 77 species. Notes are given on the seasonal history of these species, the results in many cases being compared with those obtained by other authors in different localities. Adults of *Euxoa* (*Agrotis*) *exclamationis*, L., occurred between the end of May and the end of July, the maximum flights occurring on 13th, 24th and 26th June. The numbers decreased considerably after this date, but rose again slightly between 16th and 26th July. No moths of this species were caught between 30th July and 15th August, but a few were caught between 15th and 25th August, indicating the possibility of a partial second generation that becomes more clearly defined in more southerly areas. *E.* (*A.*) *segetum*, Schiff., was the most abundant of all the species. The adults are on the wing from the last week in May to the last week in June and again from the end of June to 23rd September. The second generation exceeds the first in numbers, probably because of heavy mortality among the hibernating larvae from climatic conditions and natural enemies. *Barathra* (*Mamestra*) *brassicae*, L., has two generations, but they overlap. This species is less attracted to molasses baits than the other two. Both under laboratory and field conditions about 25 per cent. of the larvae hatching at the end of June and beginning of July produce adults about the middle of August. The flight of the second generation was considerably reduced by the activities of parasites and fungous diseases. In some localities parasitism of the larvae by *Tachina larvarum*, L., amounted to 63 per cent.

[Tol'skiĭ (A.).] **Тольский (А.). A short Review of the Experimental Work carried out by the Kazan Institute of Agriculture and Forestry in 1926.** [*In Russian.*]—*Nachr. Inst. Land- u. Forstw. Kasan*, no. 3, pp. 1–9. Kazan, 1927.

In the course of this report a brief section dealing with forest entomology is contributed by G. S. Sudeĭkin. In certain experimental plots injured and withered pines were found to be infested by the bark-beetles, *Myelophilus* (*Blastophagus*) *minor*, Hart., *M.* (*B.*) *piniperda*, L., *Ips sexdentatus*, Börn., and *I. acuminatus*, Gyll. The percentage of injured and dying trees decreases gradually from a burnt area or neglected clearing towards the heart of the healthy stand.

Examination of the soil for Melolonthid larvae revealed the presence of *Rhizotrogus solstitialis*, L., *Phyllopertha horticola*, L., *Anomala aenea*, DeG., and *Serica brunnea*, L., especially in clearings.

[Shmelev (N.).] **Шмелев (Н.).** *Melolontha hippocastani*, **F., in the Mari Autonomous Region.** [*In Russian.*]—*Nachr. Inst. Land- u. Forstw. Kasan*, no. 3, pp. 47–58. Kazan, 1927.

A survey of the proportion of the various stages of the larvae of *Melolontha hippocastani*, F., in the soil suggests that an outbreak of the beetles may be expected in 1929 and only very small flights in the two following years. During the latter part of July, 73 per cent. of the larvae occurred in the top layer of the soil. Pupation was observed during the first half of June, adults appearing from the beginning of July to September. Old bare areas are very slightly infested by the larvae, whereas burnt tracts, where as a result of clearing large areas are covered with young birch, are heavily infested. Wherever the infestation of the soil exceeded 6 larvae to the square metre, injury to pines was observed. The beetles apparently avoid laying their eggs in soil where the humus layer has been burnt. Areas previously under cultivation are almost free from larvae.

BARNES (H. F.). **The Chrysanthemum Midge** (*Diarthronomyia hypogaea* **F. Lw.**).—*Entomologist*, lxi, pp. 36–38, 1 pl., 7 refs. London, February 1928.

An account, largely taken from a paper already noticed [*R.A.E.*, A, xiii, 121], is given of the bionomics and control of *Diarthronomyia hypogaea*, F.Lw., which was found for the first time attacking chrysanthemum under glass in Britain in 1927 [*R.A.E.*, A, xvi, 10].

MASSEE (A. M.). **Entomology.**—*Ann. Rep. East Malling Res. Sta. 1927*, xv, pt. 1 (general), pp. 67–68. East Malling, Kent, May 1928.

The results of continued trials of tar distillate washes [*R.A.E.*, A, xv, 485] show the optimum strength of these washes to be from 7½ to 10 per cent., according to the prevalence of the eggs of Aphids or Lepidoptera. No difference was found in the effectiveness of washes with a range of boiling points of between 200 and 300° C. [392 and 572° F.], while the inclusion of colloidal sulphur or naphthalene produced negative results in attempts to render the washes toxic to red spider eggs.

Further studies of the relative resistance of apple stocks to *Aphis pomi*, DeG., and mazzard cherry stocks (*Prunus avium*) to *Myzus cerasi*, F., confirmed the possibility that even high degrees of resistance may break down at least temporarily under certain conditions. In tests of the resistance of apple seedlings to the woolly aphis [*Eriosoma lanigerum*, Hausm.], Northern Spy crossed with Doucin II maintained immunity after very stringent tests, and several others show a high degree of resistance, though some proved very susceptible [*cf. loc. cit.*]. Continued experiments are being made to determine the right time to apply arsenical sprays against the apple sawfly [*Hoplocampa testudinea*, Klug]. Sawfly larvae were detected in the soil for the first time at East Malling at considerable depths. The information contained in this paper concerning gall-mites on bush fruits has already been noticed [*R.A.E.*, A, xv, 482, 483].

MASSEE (A. M.). **Winter Washes; Modern Developments in their Use.**—*Ann. Rep. East Malling Res. Sta. 1927*, xv, pt. 1 (general), pp. 70–78. East Malling, Kent, May 1928.

This is a summary of the modern developments of winter washes for fruit trees. The sprays discussed are caustic soda, hot-lime and lime-sulphur, with particular reference to the use of the two latter as delayed dormant sprays at the time that insect eggs are hatching, and the tar-distillates. Mention is also made of dinitro-cresol and its salts, which are now known to possess ovicidal properties.

Petherbridge (F. R.). **How the Ribbon-like Scars on Apples are made by the Apple Sawfly** (*Hoplocampa testudinea* **Klug**).—*J. Pomol. Hortic. Sci.*, vii, no. 1–2, pp. 60–62, 3 pls. London, July 1928.

A detailed account is given of observations on the way in which *Hoplocampa testudinea*, Klug (apple sawfly) causes ribbon-like scars on apples, and it is pointed that these should not be confused with those of *Plesiocoris rugicollis*, Fall., which are usually much more irregular. The sawfly scars usually start near the calyx where the eggs are laid.

Gimingham (C. T.) & Tattersfield (F.). **A Report on Field Trials with 3 : 5-Dinitro-o-cresol and its Sodium Salt for Winter Spraying.**—*J. Pomol. Hortic. Sci.*, vii, no. 1–2, pp. 146–155. London, July 1928.

The authors collate a number of reports on the results of trials with 3 : 5-dinitro-o-cresol and its sodium salt in orchards in different parts of England [*cf. R.A.E.*, A, xiv, 514 ; xv, 575]. The dinitro-cresol wash contained 0·2 per cent. dinitro-cresol with 2 per cent. solvent, and the sodium dinitro-cresylate wash was diluted to a strength equivalent to 0·2 per cent. dinitro-cresol and 0·5 per cent. soft soap was added after dilution.

The following is largely taken from the authors' conclusions: Except in one case, both washes showed approximately the same efficiency in controlling Aphids and winter moth [*Cheimatobia brumata*, L.] on apples and plums as a good tar-distillate wash at 10 per cent. Attack by *C. brumata* was reduced but not eliminated, and this is in agreement with previous results. The results of the experiments in Berkshire differed, however, from those obtained elsewhere and indicated but little reduction of caterpillars and only partial control of *Psylla* [*mali*, Schmidb.]. There is no satisfactory evidence of any effect on Capsid eggs. No important differences between the results obtained with the two washes were noted. Both substances stain the skin and clothes yellow, which is a disadvantage from a practical point of view. No other difficulty was met with during the actual spraying operations except in one case, where, owing to extremely hard water, it was found necessary to use casein instead of soap with the sodium dinitro-cresylate wash. In no case was any injury to the trees reported, but undercrops, notably autumn-sown beans, were completely destroyed by the washes.

Tutin (F.). **Investigations on Tar Distillate and other Spray Liquids, Part I.**—*Rep. Agric. Hortic. Res. Sta. Bristol 1927*, pp. 81-90, 3 pls. Bristol [1928].

An account is given of further investigations into the ovicidal properties of certain products obtained from tar distillates [*cf. R.A.E.*, A, xv, 613]. The material employed for the greater part of the work was a vertical retort tar boiling from 190 to 360° C., which contained nearly 20 per cent. of "tar acids." Some basic material (quinoline, etc.) was removed and not further examined, since these bases are known to be practically valueless for egg-killing purposes. The tar acids were then separated from the neutral material, and both these products were submitted to fractional distillation. The neutral material was divided into two fractions, one boiling from 190 to 280° and the other from 280 to 360°. The first fraction, on cooling, deposited naphthalene while the second yielded anthracene; both the solid products were removed, and only the liquid portions of the distillate were used. The tar acids were divided into four fractions, boiling respectively from about 190 to 220°, 220 to 250°, 250 to 280°, and 280 to 360°. The two intermediate fractions were relatively small and were not further employed. The fraction boiling from 190 to 220° consisted essentially of cresols and is referred to as the " low phenols." Emulsions were made by means of castor oil soap with the total distillate (a product comparable to the ordinary tar distillate spray liquids); with the low-boiling neutral and high-boiling neutral materials; with the " low neutral " together with 20 per cent. of " low phenols "; and with the " high neutral " and 20 per cent. of the " high phenols." A large number of tests were made with these five materials against the eggs of the winter moth [*Cheimatobia brumata*, L.] at strengths of 5 and 8 per cent. Other batches of winter moth eggs were sprayed at the same time with one of the best known brands of " carbo " washes and with dinitro-cresol preparations [see preceding paper]. The results clearly showed the superior ovicidal powers of the " high neutral " emulsion and the " high neutral " with 20 per cent. " high phenols," the nitro-products in particular being relatively ineffective. It is, therefore, concluded that the portion of the tar distillate boiling above 280° is more toxic to the eggs than the material of lower boiling point or the total tar distillate and that the addition of phenols (tar acids) to the neutral materials actually lowers the toxicity of the product.

An emulsion of the neutral material sufficiently stable to be employed on a commercial scale could not be prepared by the employment of any soap, owing to the absence of tar acids. Two sulphonated oils known as Agral WB and Agral AX are, however, capable of producing a perfectly stable emulsion with any neutral product. For general purposes 10 per cent. by volume of sulphonated oil should be added to the " high neutral " tar oil; water should then be added to make an emulsion of the required strength and alkali (sodium hydroxide) introduced at the rate of 0·6–1·8 gms. to each cc. of sulphonated oil present in the emulsion. The alkali should preferably be dissolved beforehand in a little water. When using excessively hard water, however, the proportion of sulphonated oil and alkali must be increased. Emulsions prepared in this manner are not affected by the absorption of CO_2 and, consequently, an equivalent amount of ordinary washing soda [$NaCO_3$] may be used instead of the sodium hydroxide ($NaOH$).

A comparison of the relative toxicity to eggs of the ringlet butterfly [*Aphantopus hyperantus*, L.] of a 4 per cent. emulsion of " high neutral " material and one of the best brands of tar distillate washes at 4 per cent. strength showed that the former killed 98 per cent. while the latter killed only about 45 per cent. Ordinary tar distillates can only be used as dormant sprays. In an experiment on plum carried out at the beginning of July with a 2 per cent. emulsion of the total tar distillate made with castor oil soap and an emulsion of the " high neutral " product made with sulphonated oil, the former caused such damage that all the leaves died, while no trace of visible damage was caused by the latter. Other experiments were also carried out with different concentrations of the " high neutral " material and other preparations containing tar acids, and in each case the former was found to be distinctly the least toxic to the plant. Experiments with horizontal retort tar distillate and diverse products from coke oven tar show that for the purpose of obtaining "high neutral" material the source of the tar is immaterial.

It has also been found that Agral WB and Agral AX may be used with advantage for the preparation of a large number of other emulsions suitable for use as spray liquids, highly satisfactory emulsions having been made with rape oil or other fatty oils, and with such liquids as paraffin, carbon tetrachloride, nitro-benzene, etc. Rape oil emulsions may also be prepared with Agral I, a new preparation possessing great wetting powers. Nicotine sprays prepared with Agral I are more efficient against woolly aphis [*Eriosoma lanigerum*, Hausm.] than the usual nicotine-soap spray liquid.

CHRYSTAL (R. N.). **The Occurrence of** *Pityogenes bidentatus*, **Herbst, the Two-toothed Pine-beetle, on frosted Douglas Fir.**—*Forestry*, ii, no. 1, pp. 28–29. London, 1928.

This note is an addendum to a paper by W. R. Day on damage by late frost to various conifers. A description is given of the damage done by *Ips* (*Pityogenes*) *bidentatus*, Hbst., to frost-cankered Douglas fir [*Pseudotsuga taxifolia*] in Norfolk. A tree submitted for examination showed typical frost cankers, in which the beetles had been working; apparently attacks had been begun the previous year, as only one brood tunnel was found from which 6 adult beetles were taken, no immature stages being present. The exit holes of several other beetles were observed in the bark, and another female was found boring into a green branch node higher up the stem; the galleries covered an area of about 5 ins. in a vertical direction, completely encircling the stem and consisting of two well-marked ones and a third which was rather indefinite. The attack of the beetle evidently followed closely upon frost and fungus damage.

FISHER (R. C.). **Timbers and their Condition in Relation to** *Lyctus* **Attack.**—*Forestry*, ii, no. 1, pp. 40–46, 17 refs. London, 1928.

Severe injury is caused to hardwood timber by species of *Lyctus*, of which *L. linearis*, Goeze, *L. brunneus*, Steph., *L. planicollis*, Lec., and *L. parallelopipedus*, Melsh., now occur in Britain. Conifers have not as yet been found to be attacked by these beetles, the eggs of which are laid in the pores or vessels of hardwoods, those with numerous large vessels being the most susceptible. Oak, ash, sweet chestnut and walnut suffer severely. There is a definite correlation between attack by *Lyctus* and the size and number of pores in the wood [see next paper], the size of the pores as compared with the maximum size of an egg apparently determining whether oviposition occurs. The eggs are always laid in the pores of the wood; *L. linearis*, which was thought to deposit them in cracks or fissures in the wood, actually places them in pores exposed within the cracks. When the sapwood is reduced to a fine powder, attack by *Lyctus* ceases and does not continue into the heartwood. In some tropical and subtropical timbers, however, differentiation between the heart and sapwood is difficult, and occasionally where a piece of heartwood overlies the infested sapwood, larvae or emerging adults may accidentally tunnel in it, but in such cases the attack does not continue or result in destruction of the timber. The optimum conditions in wood for the development of *Lyctus* are not known, but investigations revealed that *L. brunneus* will infest newly felled wood, and can develop in timber that has not been seasoned for any appreciable time.

The fact that *Anobium* and *Lyctus*, both of which attack oak, are never found in the same piece of timber indicates that at some stage after felling the timber becomes distasteful to *Lyctus* and attractive to *Anobium*, the latter being generally associated with old and well-seasoned wood. Further experiments, the technique of which is described, have been conducted to ascertain how far the moisture content of oak affects its liability to attack.

It was found that *Lyctus* will attack oak when it is green and has a moisture content of as much as 40 per cent., and oviposition and the development of larvae took place in samples of wood with a moisture content varying from 28 to 10 per cent. Where, however, the moisture content fell below 8 per cent., oak was not attacked, a higher moisture content being apparently more favourable for the development of *Lyctus* than a very low one. Oven-dried oak sapwood, allowed to take up moisture from the atmosphere before being exposed to infestation, was attacked quite as readily as oak that had not been dried. It is suggested that *Lyctus* will thrive only in timber that is in a suitable condition for the growth of a particular micro-organism with which it is associated, the wood serving merely as a substratum on which this organism feeds and develops. A fungus has been obtained from a series of timbers attacked by *Lyctus*, and its reappearance at long intervals from quite different samples of infested timbers suggests that it may perhaps always be associated with these beetles.

Clarke (S. H.). **On the Relationship between Vessel Size and** *Lyctus* **Attack in Timber.**—*Forestry*, ii, no. 1, pp. 47–52, 1 pl. London, 1928.

The size of the vessels in timber appears to be a limiting factor in infestation by *Lyctus*. Where the largest vessels are less in diameter than the smallest *Lyctus* eggs, the wood is thought to be immune, and as the percentage of vessels of greater diameter than the insect's egg increases, the liability to attack becomes greater. The vessels of 108 specimens of wood, representative of 71 species of widely distributed genera, were measured by a method consisting of the projection of an image on to a scale reading directly in parts of a millimetre. Graphs are given showing the vessel size and degree of susceptibility of the various types of wood. Among those that are most susceptible are walnut, ash, sweet chestnut and oak; horse chestnut, cherry, pear, lime, beech, maple, poplar, willow, birch, and mahogany are among those the vessels of which are smaller than *Lyctus* eggs and which are, therefore, probably immune.

Fisher (R. C.). **The Relation of the Elm Bark-beetles to their Host Trees.**—*Forestry*, ii, no. 1, pp. 53–61, 1 pl., 6 refs. London, 1928.

A series of experiments have been conducted in London parks to ascertain the relationship between the health of elm trees and their liability to attack by the elm bark-beetles, *Scolytus scolytus*, F. *destructor*, Ol.) and *S. multistriatus*, Marsh. These beetles normally breed in felled logs, but are sometimes very injurious to standing trees. *S. multistriatus* generally tunnels in the more slender branches of trees and in those with thin bark, being found in the crown when large trees are attacked; *S. destructor* attacks large branches where the bark is thick and coarse and may be found in the main stem. In young trees both species may be found together in the main stem, and where these have a diameter of less than 4 ins. *S. multistriatus* only is found. Experiments were made with trees from 6 to 12 ft. in height and 2 to 4 ins. in diameter at breast height, some of which were root-pruned before transplanting while others were not. The results indicate that a healthy, vigorously growing tree is not liable to attack, but that if a tree is subjected to a check in its growth, such as pruning, it is then attacked; not all the root-pruned trees were, however, attacked, and it is therefore concluded that if the check is too severe, the trees may be in too sickly a condition for infestation. It is probable that the sap content may be too high in healthy trees and too low in trees with very poor or no foliage. A second experiment indicated that delay in transplanting elms, even although the roots are normal, is sufficient to render them liable to attack; all trees should be transplanted before the middle of March, and if possible, before the end of February.

Beetles were not found on root-pruned trees until 11th July, but the first were found on 26th June on trees the transplanting of which had been delayed; the trees most severely attacked were in an intermediate condition of foliage, neither possessing a healthy normal foliage, nor being entirely devoid of leaves. Where the trees were growing vigorously, the percentage of moisture was highest and the beetles were absent; in root-pruned trees that bore no foliage the percentage was less and the beetles were only present in small numbers, if at all; where, however, the moisture content had only been slightly decreased in trees the transplantation of which had been delayed, the infestation was heavy.

In young trees the beetles are present in the main stem, and the attack is easy to detect; in the case of old trees, although the same conditions govern the liability to attack, this generally begins in the crown and spreads gradually downwards, the tunnels being often confined to one side of the tree. It is apparent that infested trees or limbs are deficient in moisture content, and at the first time of attack may, perhaps, not visibly differ from healthy ones. Elm bark-beetles do not attack trees severely infested with fungi, but it is probable that the death of many elms is caused by the action of fungi, for the development of which the way has been prepared by the beetles. Newly emerged immature bark-beetles may feed at the nodes of small branches on a healthy tree without impairing its health, a callus forming rapidly over the wound, even if several individuals have fed on the same branch, provided that the twig has not been entirely ringed.

THOMPSON (W. R.), U.S. Bur. Ent. **A Contribution to the Study of the Dipterous Parasites of the European Earwig** (*Forficula auricularia*, **L.**).—*Parasitology*, xx, no. 2, pp. 123–158, 6 pls., 4 figs. Cambridge, July 1928.

In view of proposals to introduce natural enemies of *Forficula auricularia*, L., into New Zealand and parts of the United States, a study has been made of the two Dipterous parasites of this earwig in Europe. These are *Digonochaeta setipennis*, Fall., and *Rhacodineura* *antiqua*, Mg. The literature with regard to these two species is reviewed, and a detailed original account of the anatomy and biology of each is given. The exact time of emergence of *D. setipennis* is not known. The fly deposits an egg, containing a fully developed embryo, close beside a resting earwig. The larva immediately hatches and attacks an earwig, boring into the body, development being completed in the blood and fat of the host, instead of the parasite becoming sarcophagous as many Tachinid larvae do. The larva emerges for pupation, which generally occurs under some shelter close to the body of the host, which may survive for a time but is incapable of reproduction. Both in the north and south of Europe two types of pupae of *D. setipennis* are found, the one developing rapidly and issuing as an adult in summer or autumn and the other hibernating. This parasite has been recorded from a number of other hosts, including no less than four orders and comprising many Lepidopterous larvae. Hyperparasites reared from *D. setipennis* include an undetermined Tetrastichine, the Ichneumonid, *Phygadeuon scaposus*, Thoms., and the Chalcid, *Dibrachys cavus*, Wlk. (*boucheanus*, Ratz.).

Rhacodineura antiqua deposits a minute egg on anything that earwigs have fed on during the previous night, and the egg is swallowed by the earwig coming to continue the unfinished meal. The method of feeding is described, the normal food of the parasite being blood and fat. The larva emerges to pupate. The seasonal history of both parasites varies in different regions. *R. antiqua*, although in Europe it is much less common than *D. setipennis*, is widespread and capable of living in a greater variety of climatic conditions. In no collections made by the author in Europe has the mortality from *D. setipennis* exceeded 10 per cent. of the earwigs present, while that from *R. antiqua* has been less than 1 per cent.; whether they will become more important factors in control in a new environment remains to be seen.

Congrès national pour la lutte contre les ennemis des cultures, tenu à Lyon, June 1926.—8vo, 375 pp., numerous figs. Paris, Serv. agric. Cie P.L.M., 1927. Price *Fr.* 15.

The papers read at this Congress contain a good deal of information that has already been noticed from other sources. Among those dealing with entomological problems are: Winter Treatments of Fruit Trees with Mineral Oil Emulsions in Copper Sulphate Sprays and with Lime-sulphur, and Geometrid caterpillars [*Cheimatobia brumata*, L., and *Hybernia defoliaria*, Cl.] on Fruit Trees, by A. Paillot; Some Aphids attacking Peach Trees, by A. Paillot and Jean C. Faure; The Problem of *Leptinotarsa decemlineata*, Say [*cf. R.A.E.*, A, xiv, 465], by J. Feytaud; The Biology of the Cabbage Pierid [*Pieris brassicae*, L.] and Methods of destroying it, by Jean C. Faure; The Aphids of Vegetable Crops, by L. Gaumont; *Apion carduorum*, Kirby (an Enemy of Artichokes) [*cf.* xiii, 95], by E. Baillargé; A Note on the Thrips attacking Carnations [*cf.* xiii, 164], by G. Raymond; Remedial Measures available against Vine Moths [*Clysia ambiguella*, Hb., and *Polychrosis botrana*, Schiff.], by B. Trouvelot; The Pests of Olive Trees (which are grouped according to the measures suitable for their control), by R. Poutiers; The Principal Pests of Fruit and Vegetable Crops in Northern Africa, by M. Delassus; Some General Principles in combating Noxious Insects, by A. Paillot; The Campaign against Pests of Crops in Seine-et-Oise, by E. Blanchard; and Current Insecticide Problems, by F. Willaume, in which the author reviews recent work on the subject [*cf.* xvi, 111].

A. Paillot describes the recent outbreak of *Neurotoma nemoralis*, L., on peach, etc., in some of the Provinces of south-eastern France [*cf.* xiv, 55]; the outbreak began to subside in 1923 and finally died down, largely owing to the activities of the Ichneumonid parasites, *Eulimneria* (*Limnerium*) *crassifemur*, Thoms., and *Holocremnus incrassator*, Holmgr. A paper on the pests of market-garden crops, by L. Gaumont, describes the digging of trenches with a system of piping for treating the soil with chloropicrin against subterranean insects, particularly cockchafer grubs, by means of a compressed air apparatus powerful enough to pump the toxic gas into the soil. Dr. Voglino, on the subject of pine processionary caterpillars [*Thaumetopoea*], points out that the destruction of the nests presents considerable practical difficulty. He has experimented in Italy with a finely powdered fungus, which, during cool, damp, weather has given good results against the larvae. In France, although collection of the larvae is compulsory, it is almost impracticable on the higher trees.

MARCHAL [P.]. **Travaux des Stations d'Entomologie agricole de l'Institut des Recherches agronomiques.**—*C.R. Acad. Agric. Fr.*, xiv, no. 27, pp. 901–906. Paris, 1928.

The work that was carried out at the various entomological stations in France during 1927 is briefly reviewed.

VAYSSIÈRE (P.). **La cécidomyie de la grappe** (*Contarinia viticola*, **Rübs.**) **en Champagne.**—*C.R. Acad. Agric. Fr.*, xiv, no. 27, pp. 906–910, 9 refs. Paris, 1928.

A Cecidomyiid, thought to be *Contarinia viticola*, Rübs., is recorded for the first time from France, causing injury to the flower-buds of vines in three localities. As many as 50 per cent. of the flowers in a bunch may be attacked. The larvae, of which there may be 2–10 in the same flower, devour the stamens and pistil; the bud remains closed, and eventually withers and drops. Observations made in the Rhineland and in the United States show that the adults of *C. viticola* appear in the vineyards at the time of the formation of the flower-buds or immediately afterwards (May). The females lay 6–10 or more eggs, and the larvae hatch rapidly and complete their development in a few days (during the period of flowering). They burrow into the surface layer of the soil to make their cocoons and remain there until the following spring; pupation then takes place, and adults emerge a few days later. The amount of damage caused depends mainly on the number of flower-buds suitable for oviposition at the time of the appearance of the adults in the vineyard.

Arsenical treatments are useless, but in the localities invaded this year by *C. viticola*, the first applications against the vine moths [*Clysia ambiguella*, Hb., and *Polychrosis botrana*, Schiff.] next year should consist of nicotine or pyrethrum. Since the larvae pass nearly 11 months in the soil, any cultural operations that expose the cocoons will diminish the number of adults emerging in the following spring.

CHAPPAZ [G.]. **La lutte contre la cochylis et l'eudémis en Champagne en 1927.**—*C.R. Soc. Agriculteurs Fr.*, lix, pp. 100–105. Paris, 1928.

This is a review of the successful campaign against the vine moths [*Clysia ambiguella*, Hb., and *Polychrosis botrana*, Schiff.] in Champagne in 1927 [*cf. R.A.E.*, A, xvi, 340] together with an outline of the work to be carried out in 1928.

SECRETAIN (C.). **Une industrie séricicole réalisable en France. La fabrication du crin de Florence.**—*Vie agric. rur.*, xxxii, no. 28, pp. 18–19. Paris, 8th July 1928.

Since France imports all surgical silkworm-gut, which is made from the glands of silkworms, from Spain, the practicability of rearing the particular races of *Bombyx mori* necessary for this industry in France is pointed out and a description of them is given.

LATIÈRE (H.), TROUVELOT (B.) & WILLAUME (F.). **Les ravageurs des arbres fruitiers. Traitements pratiques. Tome I.**—8vo, 97 pp., 7 pls., 206 figs. Paris, Maurice-Mendel, 1928. Price *Fr.* 19.50.

This practical handbook has been compiled with the collaboration of twelve French entomologists for the use of fruit-growers. It contains a description of the characters, classification and methods of observation of insect pests and beneficial insects found on fruit trees, and their effect on the tree, the text being reduced to a minimum and supplemented by many clear diagrams and text figures enabling the grower to make prompt identification of any damage observed.

CHEVALIER (J.). **Action du soufre à l'état naissant contre les divers parasites.**—*Bull. agric. Algérie-Tunisie-Maroc*, xxxiv, no. 6, pp. 105–107. Algiers, June 1928.

The insecticidal and fungicidal action of powdered sulphur is primarily due to the products of oxidation and reduction that arise on contact with albuminoid materials and in the presence of damp air. Oxidation, the final product of which is sulphuric acid, acts by modifying the pH (which is diminished to such an extent that it inhibits the development of fungi) and by causing the coagulation and destruction of living protoplasm. It is to this that scorching is due. The products of reduction result in the formation of hydrogen sulphide, which acts physiologically by paralysing the cells and in certain cases again gives rise to precipitated sulphur. The action of sulphur is more vigorous the more finely it is divided, and the maximum effect is obtained with nascent sulphur in which the division is atomic.

By breaking up the hydrocarbons derived from the resinous acids of colophany in the presence of sulphur, a yellowish brown oily liquid, containing one molecule of substituted sulphur, is obtained. This is insoluble in water but soluble in alcohol, kerosene, oils and soaps. Owing to its solubility in soap a stable emulsion is obtained (by dilution with water and agitation) that may be used as a spray or wash. The surface tension of the emulsion is sufficiently low to wet animal and vegetable tissues, a quality necessary when the toxic effect is to be obtained by contact. Such aqueous emulsions used at a concentration of ½–2 per cent. usually showed toxic effects on various insects and fungi; they adhere to vegetable tissues, and their protective effect lasts well. At these concentrations they wet the foliage without causing injury to the leaves or buds, and they may be used on flowers without spotting them; they are not toxic to man or domestic animals. These emulsions, deposited in a thin film on the vegetable surface, are decomposed after a certain time by the air in contact with organic material and liberate active sulphur in a colloidal state, minutely divided and assimilable by the plant, which exerts an insecticidal and fungicidal action.

Insect pests of market-garden crops, particularly Coleoptera and Lepidoptera, are killed when hit by sprays of these emulsions. They are particularly effective against Coccids and Aphids, even the woolly aphis [*Eriosoma lanigerum*, Hausm.] being destroyed by thorough applications at intervals of a few days or better still by brushing with a 5 per cent. emulsion.

LEUZINGER (H.). **L'acariose des abeilles en Valais 1922–28.**—*Bull. Murith.*, xlv, reprint, 21 pp., 2 pls., 3 figs., 7 refs. Sion, 1928.

This survey of acarine disease of bees in the Canton of Valais includes a brief general history of the disease, some account of the mite *Acarapis* (*Tarsonemus*) *woodi*, Rennie, its causal agent, and a discussion regarding the probable method of propagation. The disease has increased steadily in Switzerland of recent years. The only effective means of control yet discovered is accurate detection and immediate destruction of infected hives. Legislation was formulated in 1923 to enforce the observance of control measures. It has proved impossible, however, to stamp out the great centre of infection in Central and Lower Valais, the total destruction of hives not being practicable on account of the wide area involved and the great number of hives. It is therefore proposed to create infection zones within which control measures will be abandoned. These zones will be closed to all export of bees, although exchanges within them will be authorised. In the small centres of infection in the Upper Valais it is proposed to destroy all the hives, and to stop apiculture for some time, subsequently procuring healthy bees.

WILLE (J.). **Die durch die Rübenblattwanze erzeugte Kräuselkrankheit der Rüben.** [The Leaf-crinkle Disease of Beet caused by the Beet Leaf Bug.]—*Arb. biol. Reichsanst. Land- u. Forstw.*, xvi, no. 1, pp. 115–167, 8 figs., 44 refs. Berlin, April 1928.

The leaf-crinkle disease of beet caused by the Tingid, *Zosmenus* (*Piesma*) *quadratus*, Fieb., is widely distributed and increasing in Germany. The disease is influenced by the number of bugs on a plant, the duration of their feeding and the age of the plant. Severe crinkle can be produced by 10 bugs feeding for 2 hours on seedlings, or by 3 bugs for 24 hours. Beet plants with less than five pairs of leaves are susceptible, but older plants cannot be infected experimentally. Infections produced by intermittent feeding showed that no immunity is acquired; on the contrary, the disease becomes intensified.

The primary symptoms are light-coloured puncture spots, the wilting and flabbiness of the seedlings and their early death, all of which are the immediate result of a mechanical or chemico-toxic injury by the bug. After an incubation period of 21–65 days, the numerous secondary symptoms appear, the more important being swelling, crookedness and glassiness of the leaf-veins and leaf-stems, crinkle due to inflation of the leaf-parenchyma, arrest of growth, dying of the older leaves, and death before the harvest. The injury, as indicated by the loss in weight of the beets, is greatest if the incubation period is short. The disease develops most rapidly if the bugs are numerous, their feeding prolonged and the temperature high. Some beets are immune, but the immunity is peculiar to individual plants and is not a varietal character. Wild Chenopodiaceae are not subject to the secondary symptoms, but beans were infected artificially. As in some experiments bugs only gave rise to crinkle after feeding on infected leaves, the disease is thought to be due to a virus. The virus hibernates in the bugs and in infected beets, but not in other plants. Leaf-crinkle is similar to the curly-leaf disease caused by *Eutettix tenella*, Baker, in the United States, but is not identical, as beets resistant to the latter obtained from North America were severely infected with crinkle.

The disease may be combated chiefly by breeding a strain of beets from individual resistant plants. No success attended efforts to obtain parasitism of the eggs of the bugs by *Trichogramma evanescens*, Westw. Belts of trap plants are only useful if the adult bugs are killed by sprays, and the plants are ploughed in and the ground rolled to destroy the larvae, which are unable to emerge from a depth of two inches. At such a depth, too, only a few of the eggs are able to hatch.

WILLE (J.). **Schädlinge des Salatsamenbaus und ihre Bekämpfung.** [Pests of Salad Seed Cultivation and their Control.]—*Anz. Schädlingsk.*, iv, no. 6, pp. 73–75. Berlin, 15th June 1928.

The fly, *Phorbia* (*Chortophila*) *gnava*, Mg., and the Tortricid, *Eucosma* (*Semasia*) *conterminana*, H.-S., are serious pests of the seed-crop of various varieties of lettuce in Germany. The fly oviposits in the newly-opened flower-heads. The larva hatches in 3½ days and feeds on the seeds and flowers. It is mature in 30–40 days and pupates in the ground at a depth of 2–5 inches or more. The moth lays its eggs, usually in batches, on the buds or opening flowers. The larvae hatch in 8–10 days and feed on the seeds and hardening fruits and destroy the pappus hairs. They hibernate in cocoons in the ground, in hedges or among weeds, etc., pupating in early spring. The moths emerge in June. *P. gnava* caused about twice as much injury as the Tortricid in flower-heads from 70 different localities, the total injury varying from 60 to 100 per cent. If the lettuce is cut at the proper time, the injury by the Tortricid never becomes severe, but in September it exceeds that done by the fly. All weeds and other shelter for the hibernating larvae should be cleared away. Spraying with arsenicals had only a temporary effect, lasting about six days. Experiments indicated that baits of arsenic and sugar are likely to be of value against the adults of *P. gnava*.

NECHLEBA (A.). **Beschränkte Nützlichkeit des** *Calosoma sycophanta,* **L.** [The limited Usefulness of *C. sycophanta.*]—*Anz. Schädlingsk.*, iv, no. 6, p. 89. Berlin, 15th June 1928.

While *Calosoma sycophanta,* L., is normally of some value in the control of the nun moth [*Lymantria monacha,* L.], its effect is negligible in outbreaks owing to the small numbers in which it occurs.

SPEYER (W.). **Honigtau an Apfelknospen als Folge von Raupenfrass.** [Honey-dew on Apple Buds as a Result of Feeding by Caterpillars.] —*NachrBl. deuts. PflSchDienst,* viii, no. 7, pp. 61–62. Berlin, July 1928.

The production of honey-dew is seldom associated with feeding by Lepidopterous larvae. Some instances are quoted from the literature. On the lower Elbe the author observed bud clusters of apple stuck together as a result of feeding by *Eucosma* (*Tmetocera*) *ocellana,* Schiff., and *Argyroploce variegana,* Hb. As this is unusual, it is suggested that the weather in spring caused an excess of sugar to collect in the buds, whence it escaped as a result of mechanical injury caused by the caterpillars.

ZIMMERMANN (F.). **Schorfbekämpfungsversuche in Nordböhmen.** [Work against Scab in North Bohemia.]—*Z. PflKrankh.*, xxxviii, no. 7–8, pp. 208–215, 10 refs. Stuttgart, 1928.

In the course of this report the following insects are recorded as serious pests of apple in the Elbe valley in Bohemia : the winter moth [*Cheimatobia brumata,* L.], which also attacks cherry ; the apple web moth [*Hyponomeuta malinellus,* Zell.] ; *Cydia* (*Laspeyresia*) *pomonella,* L. ; and the apple leaf-sucker [*Psylla mali,* Schmidb.]. The Coccid, *Lecanium corni,* Bch., is very numerous on plum.

BAUDYŠ (E.). **Květilka cviklová na řepě.** [*Pegomyia hyoscyami* on Beet.]—*Flugbl. phytopat. Sekt. landw. Landes-Erforschungsinst. in Brünn,* no. 39, 1925, 1 p. (Abstract in *Z. PflKrankh.*, xxxviii, no. 7–8, p. 247. Stuttgart, 1928.)

In Czechoslovakia, *Pegomyia hyoscyami,* Panz., usually oviposits first on such weeds as *Chenopodium* and *Atriplex* and then on beet. In dry weather, however, it lays its eggs exclusively on beet. In such cases the beet plants should not be thinned until all the eggs have been laid. The ground should be often hoed so as to expose the pupae to birds. In autumn the field should be ploughed deeply and should receive a mineral manure. Stable manure should never be used.

VAN STEYN (J. A.). **De dennennaaldscheede-galmug.** [The Pine-needle Sheath Gall-midge.]—*Tijdschr. Plantenziekt.*, xxxiv, no. 6, p. 181. Wageningen, June 1928.

Thecodiplosis (*Cecidomyia*) *brachyntera,* Schwaegr., has occurred in numbers in Holland on *Pinus sylvestris* and *P. montana,* some of the trees assuming a red-brown tint due to the withering of the needles.

Topp (Th.) & Jensen-Storch (Sv.). **Husbukken og dens Ødelaeggelsesvaerk.** [*Hylotrupes bajulus* and its Destructive Work.]—23 pp. Copenhagen, Fagskolen for Haandvaerkere og mindre Industridrivende, 1927.

Hylotrupes bajulus, L., the life-history of which is described, has of recent years proved to be a serious pest in roof-timbers in Denmark. In Copenhagen and its surroundings more than ten churches, several factories and 1,000 houses have been infested ; in some cases the roofs have been in danger of falling in. Nearly all the infested roofs are covered with slate, copper, lead or zinc, beneath which a very high summer temperature may occur, which dries the wood and makes many small fissures suitable for oviposition. The increasing use of fir and spruce for roof-timber is also considered an important factor in the increase of infestation. The roofs are not damaged until they are 20–30 years old, but then the attack is very considerable, often necessitating their renewal. No control measures have so far proved successful.

Hukkinen (Y.). **Peltokasvipölytin "Puhuri." Uusi, käytännöllinen keino kasvituhoojia vastaan.** [Field Crop Dusting Apparatus "Puhuri." A new, practical Method against Crop Pests.] [*In Finnish.*]—*Valtion Maatalouskoetoiminnan Tiedonantoja* [*Bull. Govt. Agric. Res.*], no. 11, 10 pp., 5 figs. Helsingfors, 1928.

The author has devised a dusting apparatus, adapted for controlling insect pests on root crops and other low-growing plants. It consists of a metal container for the dust, to the bottom of which two discharge pipes are attached. The container is connected with bellows, actuated by a shaft attached to the axle crank of a studded wheel, upon which the apparatus is pushed along the ground. Thus two rows of turnips or beet can be treated with dust at a time. The pipes can be adjusted to the different widths of rows or heights of plants. The apparatus gives an even distribution of dust and has proved effective on a commercial scale.

[Shchegolev (V. N.).] **Щеголев (В. Н.).** *Cydia pomonella*, **L., in the Orchards of the Azov Region.** [*In Russian.*]—*Byull. Severo-Kavkazs. Rostovo-Nakhichevansk. n-D. Kraev. s.-kh. opuitn. stantz.* [*Bull. N.-Cauc. Rostov-Nakhichevan-on-Don Reg. Agric. Expt. Sta.*], no. 252, 22 pp., 4 figs., 6 refs. Rostov, 1928.

All fallen fruit from four different varieties of apples was carefully inspected for the presence of larvae of *Cydia pomonella*, L., as was also the final crop. It was found that the collection of fallen fruit, which is frequently recommended as a means of controlling the moth, is of little value, as even when collections are made daily not more than a third of the fruit that has been infested contains larvae.

The seasonal history of *C. pomonella* under local conditions is briefly described. Hibernating larvae were found at different heights under the bark of the trunk or larger branches of apple and pear trees and under old sticky bands. A large number of larvae and pupae were found at the beginning of May in the cracks and under the bark of the supports in an old fruit shed in which apples had been sorted ; no adults had emerged, and only 60 per cent. of the larvae had reached the pupal stage. The adults appear in spring almost simultaneously with the flowering of the apple trees. There are two generations a year, the larvae occurring in greatest numbers under trap bands early in July and again about the end of August and beginning of September. During 1927 the second generation was not complete; the proportion of the first generation larvae entering hibernation increased with the lateness of the date of their spinning their cocoons. *C. pomonella* showed no preference for any one of the four varieties of apple examined, but the crops varied considerably owing to attack by other insects, such as *Rhynchites bacchus*, L., and *Hoplocampa* sp.

Trap bands are a valuable auxiliary measure in the control of *C. pomonella*, particularly where labour is cheap and spraying materials and equipment not easily obtained. Various materials, including plain and corrugated brown paper and coarse linen, have been tried, both with and without a filling of straw or shavings. By far the greatest number of larvae were caught under the linen bands, the filling of straw, etc., making no difference to the numbers taken. The material was folded so that the piece nearest the bark was slightly narrower than the one outside, the latter being about 7 inches wide. The bands were applied about 7–14 inches above the soil surface, with the folded edge uppermost, and were firmly tied round the upper edge.

[Filip'ev (I. N.).] **Филипьев (И.Н.). Phenology and Injurious Insects.** [*In Russian.*]—*Ann. State Inst. Expt. Agron.*, v, no. 6, pp. 441–456, 7 charts, 20 refs. Leningrad, 1927.

The importance of phenological observations in relation to noxious insects is discussed, and the need for more widespread studies in this direction is pointed out.

Romeo (A.). **Osservazioni su alcuni Pentatomidi e Coreidi nei dintorni di Randazzo (Catania).** [Observations on some Pentatomid and Coreid Bugs in the Neighbourhood of Randazzo.]—*Ann. R. Ist. sup. agrar. Portici*, (3) ii, pp. 261–268, 1 fig. Portici, 1927.

Hazel-nuts, an important crop in Sicily, are injured by bugs, those found in the summer of 1924 being, in order of abundance, *Gonocerus acuteangulatus*, Goeze, *Carpocoris pudicus*, Poda, and *Palomena prasina*, L. They perforate the ligneous pericarp and attack the seed, feeding at night. The injury is seen only when the nut is opened, the tissues being more or less discoloured and shrunken. The percentage of injured nuts varied from 15 to 35, being higher in irrigated areas, because the nuts remain longer on the tree and are thus exposed for a longer period. Adult bugs were present in June, and in the second half of July another generation of *G. acuteangulatus* was observed. This became numerous in August, while the previous adults gradually disappeared. These bugs are attacked by the Reduviid, *Rhinocoris iracundus*, Poda.

Malenotti (E.). **Lo *Sminthurus viridis*, Lubb., dannoso al frumento.** [*S. viridis* injurious to Wheat.]—*Atti Accad. Agric. Sci. e Lett. Verona*, (5) v, reprint, 11 pp., 3 figs., 1 ref. Verona, 1928.

Records of injury to cultivated plants by Collembola of the family Smynthuridae are reviewed, and a severe infestation of wheat on clay soil near Pisa by *Smynthurus viridis*, L., is discussed. The fields were subject to flooding, and the infestation was limited to wheat that had followed lucerne. A short description of *S. viridis* is given, and information on its biology is taken from a recent paper by Davies [*R.A.E.*, A, xvi, 230]. The infestation was controlled by spraying either with a 1½ per cent. solution of lead arsenate paste or with a 2 per cent. solution of carbolic tobacco extract.

RICCHELLO (A.). **Contributo alla conoscenza della mosca del carciofo** (*Agromyza andalusiaca*, **Strobl) e dei suoi parassiti.** [A Contribution to the Knowledge of the Artichoke Fly, *A. andalusiaca*, and its Parasites.]—*Boll. Lab. Zool. Portici*, xxii, pp. 81–147, 33 figs. Portici, 4th June 1928.

A study of *Agromyza andalusiaca*, Strobl, which is a pest of artichoke, *Cynara scolimus*, in Italy and Spain, was conducted in 1926–27 at Portici. Descriptions of all stages of the fly are given. The larva lives within the larger leaf-veins, irregularly attacking also the parenchyma on either side of a vein. It has not been found in other Compositae near Naples. The adults feed on sugary substances and particularly on the juice of the artichoke leaves, which the females require to mature their eggs and obtain by punctures with their ovipositors. Oviposition, which is fully described, can occur 5–6 days after emergence. The flies are active in sunshine, and in the laboratory adult life never exceeded 20 days. Incubation took 7–8 days, both in autumn and in spring. The larval mines are described in detail. The infested leaves, which contain an average of five larvae each, turn yellow and rot. When mature, the larvae pupate in the soil at a depth of 1¼–4 inches or occasionally in earth on the leaves. Near Naples there are three generations a year, adults emerging in November-December, March–April, and from October to December. Under certain conditions, especially of abundant moisture, there may, however, only be two generations, the pupal stage of the last being greatly prolonged.

Parasites observed were the Braconid, *Dacnusa navicularis* var. *cynaraphila*, n., and the Chalcid, *Stenomalus muscarum*, L. Both are described in detail. The Braconid is an endophagous parasite, infesting 80 per cent. of the host larvae under favourable conditions. First-stage larvae of *A. andalusiaca* sometimes harboured as many as four first-stage larvae of the Braconid. *S. muscarum* is an ectophagous parasite, infesting a small number of the Agromyzid larvae. It pupates in the mine made by the host.

Against the adults of *A. andalusiaca* a dust insecticide, such as Paris green, may be applied to the lower surface of the leaves while they are still wet with dew. Where this method cannot be adopted, the leaves infested by the larvae should be collected and kept in a room screened so as to permit the parasites to escape.

AYOUTANTIS (A. J.). **Greece: Introduction of the Pink Bollworm of Cotton.**—*Internat. Rev. Agric.*, xix, no. 5, pp. 486–487. Rome, May 1928.

Platyedra (*Gelechia*) *gossypiella*, Saund. (pink bollworm) has been introduced into Greece by means of long staple cotton seed imported from the United States in or after 1925. General infestation of the cotton crops of the Livadia district occurred in 1927, and damage estimated at £53,000 has already been caused there. Infestation varied from 10 to 60 per cent. according to later or earlier ripening, dependent on the variety of cotton and the soil. A decree is to be issued prohibiting the importation of cotton seed into Greece except that intended for the manufacture of cotton seed oil, which will only be admitted through the Piraeus and after disinfection at the ports of despatch or entry into Greece. Movement of cotton seed from the infested areas will also be prohibited, and the treatment of the seed and destruction of the cotton plants by fire after harvest will be made compulsory.

HALLAGE (R.). **Syria: "Olive Fly" Control Experiments in 1927.**—*Internat. Rev. Agric.*, xix, no. 5, p. 489. Rome, May 1928.

During experiments with bait-sprays against *Dacus oleae*, Gmel., 1 part by weight of a solution containing 88 parts of molasses, 2 of sodium arsenate, and 9 of water was diluted with 9 parts of water and used for spraying (at the rate of about 2 gals. for 20 olive trees) or for soaking bundles of twigs hung up in the trees. This measure was repeated on four occasions at intervals of 20 days. In the case of treated trees only 3 or 4 per cent. of the olives were infested, as compared with 7–9 per cent. of those from untreated trees. No scorching occurred as a result of the spraying.

Notice of Lifting of Quarantine No. 57 (Foreign).—*U.S. Dept. Agric., Fed. Hortic. Bd.*, 1 p. Washington, D.C., 27th June 1928.

This notice revokes Quarantine 57 directed against *Porthetria dispar*, L., and dealing with the importation of Christmas trees and decorative plants from Quebec [*R.A.E.*, A, xii, 447].

MAGNESS (J. R.). **The Removal of Spray Residue from Fruit.**—*Better Fruit*, xxii, no. 12, pp. 7–8 & 20. Portland, Oregon, June 1928.

This paper discusses the comparative efficiency of the methods of cleaning fruit in use in Washington during 1927, and indicates the various necessary precautions. Dry cleaning with various patterns of brush and cloth wipers, which was used for about 40 per cent. of the crop, removed 15–35 per cent. of the spray residues, and hydrochloric acid, with which approximately 50 per cent. was treated, removed 56–75 per cent., while alkaline solutions, which were used for the remaining 10 per cent., proved as effective as hydrochloric acid.

REGAN (W. S.). **Oil Sprays in the Summer Program.**—*Better Fruit*, xxii, no. 12, p. 9. Portland, Oregon, June 1928.

This account of the introduction of refined oil sprays for summer application enumerates the pests against which they prove satisfactory, including the codling moth [*Cydia pomonella*, L.], red spider [*Tetranychus*] and San José scale [*Aspidiotus perniciosus*, Comst.]. Where a spreader has been employed to avoid curdling and blotching the lead arsenate, it is impossible to distinguish between fruit sprayed with a combination of oil and lead arsenate and that sprayed with lead arsenate alone, either by appearance or response to treatment for residue removal.

HARTMAN (H.). **Spray Residue Removal in Relation to the Keeping Quality of Apples and Pears.**—*Better Fruit*, xxii, no. 12, pp. 10–11, 28, 30 & 36. Portland, Oregon, June 1928.

This paper deals primarily with the detrimental effects of cleaning operations and is based on field and laboratory observations in 1926 and 1927. Injury from mechanical cleaning was less pronounced with apples than with pears, which suffered injury of various types, such as discolouration, bruising, pinhole rot, stem punctures and excessive loss of weight. No serious injury to the fruit results from the washing method when properly applied, and no washing compound has proved superior to weak solutions of hydrochloric acid, which has been used with equal success on both pears and apples. Washed fruit did not ripen faster than did unwashed fruit. The necessity for thorough rinsing is insisted upon. Good results have been obtained with the addition of a small quantity of lime in the rinsing tank. No serious effect resulted from the use of warmed solutions with temperatures not exceeding 110° F. when applied to fruit on which secondary wax had formed. Although the best results have been obtained with fruit that has been dried, moisture on the fruit at packing time has not consistently increased the amount of decay. The nature and extent of injury from core penetration, and calyx injury caused by solvents and by soluble arsenic are discussed at length. Acid burning rarely occurs except when fruit is left lying in the acid and clogging the pipes in the rinsing section, or placed in boxes previously saturated with acid. The fruit should be washed immediately after picking, as apart from the difficulty of removing residues after wax development has taken place, it dries better and runs less risk of mechanical or arsenical injury.

DIEHL (H. C.). **Suggestions derived from Spray Residue Removal Experiments of 1927 Season.**—*Better Fruit*, xxii, no. 12, pp. 13–14 & 18–19. Portland, Oregon, June 1928.

This paper deals with the relative efficiency of various cleaning methods. Commercial experience has shown that fruit can be washed or dry cleaned in such a manner as to cause no increase in the amount of decay or deterioration in storage. Fruit should be harvested and cleaned at the right stage of maturity and packed without delay, or held in cold or cool storage if delays occur before cleaning and packing. While the number of cover sprays cannot definitely determine the choice of cleaning method, as a general rule fruit treated with one or two cover sprays of lead arsenate can be satisfactorily dry cleaned, while washing is almost invariably necessary if three or more have been applied. Ease in cleaning differs with the variety of apple.

Pears can be satisfactorily dry cleaned, but suffer too much from the amount of handling involved. Not more than 30 per cent. of the residue can be removed from apples by dry cleaning. Recommendations are given for maintaining dry cleaning apparatus in good order.

Pears can be satisfactorily washed with moderate amounts of acid in concentrations not exceeding 1–2 per cent., dipping methods being feasible for residue removal. Alkaline solutions are not suitable for pears with russeted skins, which become blackened. Apples can generally be satisfactorily cleaned by the application of the cleaning solution by diffused spray, flood wash, shallow flotation or a combination of these, but deep submersion should be avoided, especially for varieties with open calyx tubes. Increased cleaning efficiency has been secured by increasing the concentration of hydrochloric acid from 1 to 6 per cent., though above 4 per cent. increased amounts do not result in proportionately increased efficiency, while the danger of damage to the fruit becomes greater. No increase in efficiency has been secured by prolonging the time of exposure to the cleaning solution. The greater efficiency of spray or flood washing methods is probably due, in addition to removal of residue by mechanical pressure, to the constant removal of the products of the chemical reaction and renewal of fresh acid. Greater efficiency has been obtained in the case of waxy apples by warming the cleaning solution to 90–100° F., no injury to apples having been observed with temperatures below 120°. Better results have been secured with warmed solutions at low concentrations than with high concentrations used cold. Instructions are given for cleaning the tanks, in which the solution should be changed at least once a day.

Methods employing alkaline solutions necessitate greater caution, as the alkalies have a solvent action on the waxes as well as the lead arsenate and are generally rinsed off with more difficulty than hydrochloric acid. Various methods of rinsing are described, and an account is given of drying agents under observation in 1927, the most efficient of which were one of the blower type with air jets so arranged as to sweep the moisture from the fruit mechanically rather than by evaporation, and some forms of cloth dryer.

Papers noticed by Title only.

Roepke (W.). **Ueber die Franssenschen Untersuchungen an schwarzen Blattläuse der** *Aphis fabae*- **Gruppe in Holland.** [Discussion of Franssen's Investigation of the "black Aphids" of the *A. fabae* Group in Holland.]—*Stettiner ent. Ztg.*, lxxxix, pp. 1–30, 1 pl. Stettin, 1928. [*Cf. R.A.E.*, A, xv, 464; xvi, 200.]

Takahashi (R.). **A new** *Phyllaphis* **from Formosa.**—*Trans. Nat. Hist. Soc. Formosa*, xviii, no. 96, pp. 146–147, 1 fig. Taihoku, Formosa, June 1928.

[Nevskiĭ] Nevsky (V. P.). **The Plant Lice [Aphids] of Middle-Asia. I.**—*Ent. Mitt.*, xvii, no. 3, pp. 182–199, 1 pl. Berlin, 5th May 1928.

Knowlton (G. F.). **Notes on a few Species of** *Neothomasia* **from Utah (Homop.: Aphididae).**—*Ent. News*, xxxix, no. 8, pp. 233–235, 1 pl. Philadelphia, Pa., October 1928.

Knowlton (G. F.). **Three new Aphids from Utah.**—*Pan-Pacific Ent.*, iv, no. 4, pp. 169–172, 2 figs. San Francisco, Cal., April 1928.

Burt (C. E.). **Insect Food of Kansas Lizards with Notes on Feeding Habits.**—*J. Kansas Ent. Soc.*, i, no. 3, pp. 50–68, 25 refs. McPherson, Kans., July 1928.

Aldrich (J. M.). **A Revision of the American Parasitic Flies belonging to the Genus** *Belvosia*.—*Proc. U.S. Nat. Mus.*, lxxiii, art. 8, pp. 1–45. Washington, D.C., 1928.

Gautier (C.) & Bonnamour (S.). **Les variétés d'***Apanteles congestus*, **Nees (Hym. Braconidae).**—*Bull. Soc. ent. Fr.*, 1928, no. 10, pp. 162–165. Paris, 1928.

King (K. M.). **Economic Importance of Wireworms and False Wireworms** [*Eleodes*] **in Saskatchewan.**—*Sci. Agric.*, viii, no. 11, pp. 693–706, 2 figs. Ottawa, July 1928. [For Summary see *R.A.E.*, A, xvi, 509.]

Park (O. W.). **Time Factors in Relation to the Acquisition of Food by the Honeybee.**—*Res. Bull. Iowa Agric. Expt. Sta.*, no. 108, pp. 185–225, 13 figs., 41 refs. Ames, Iowa, March 1928.

List of Current Quarantine and other Restrictive Orders and Miscellaneous Regulations.—*U.S. Dept. Agric., Fed. Hortic. Bd.*, S.R.A., no. 93, pp. 153–158. Washington, D.C., March 1928.

Crawford (D. L.). **Investigation of Mexican Fruit Fly** (*Anastrepha ludens* **Loew) in Mexico** [in 1913–14].—*Mon. Bull. State Plant Bd. Florida*, xii, no. 12, pp. 239–271. Gainesville, Fla., June 1928. [See *R.A.E.*, A, xvi, 259.]

Girault (A. A.). **Records of Australian Thysanoptera (Thrips). Part III.**—*Queensland Agric. J.*, xxix, pt. 6, pp. 391–394. Brisbane, 1st June 1928. [*Cf. R.A.E.*, A, xv, 659.]

Chorine (V.). **Influence de la concentration en ions H+ du milieu de culture sur la virulence du coccobacille de la pyrale du maïs** [*Pyrausta nubilalis*].—*C.R. Acad. Sci. Fr.*, clxxxvi, no. 10, pp. 657–659, 1 ref. Paris, 5th March 1928.

Wade (J. S.). **A Bibliography of the European Corn Borer** (*Pyrausta nubilalis* **Hbn.).** [914 Titles.]—*Misc. Circ. U.S. Dept. Agric.*, no. 46 (revised), 34 pp. Washington D.C.,1928. [*Cf. R.A.E.*, A, xiii, 636.]

Morstatt (H.). **Bibliographie der Pflanzenschutzliteratur. Das Jahr 1927.** [A Bibliography of Plant Protection Literature in 1927.]—*Biol. Reichsanst. Land- u. Forstw.*, iv+250 pp. Berlin, P. Parey; J. Springer, 1928. [*Cf. R.A.E.*, A, ix, 445, etc.]

Zillig (H.) & Herschler (A.). **Die Herstellung kupfer-, arsen- und nikotin-haltiger Spritzbrühen für den Pflanzenschutz.** [The Preparation of Copper Sulphate, Arsenical and Nicotine Sprays for Plant Protection Work.]—*Flugbl. Biol. Reichsanst. Land- u. Forstw.*, no. 52, 2nd edn., 4 pp., 1 figs. Berlin, May 1928.

Hase (A.). **Physiologische und ökologische Forschungen als Grundlage praktischer Massnahmen.** [Physiological and ecological Investigations as a Basis for practical Measures against Pests (a general Review of the Subject).]—*Anz. Schädlingsk.*, iv, nos. 5–6, pp. 51–58, 75–86, 183 refs. Berlin, 15th May & 15th June 1928.

Hase (A.). **Ueber einen merkwürdigen Fall von Eischnüren-Bildung bei der Mehlmotte** (*Ephestia kuehniella*). [On a remarkable Case of Egg-Chain Production in the Meal Moth, *E. kühniella*.]—*Anz. Schädlingsk.*, iv, no. 6, pp. 87–88, 1 fig. Berlin, 15th June 1928.

di Tocco (R.). **Bibliografia del filugello** (*Bombyx mori*, **L.) e del gelso** (*Morus alba* **L.).** [Bibliography of the Silkworm and of the Mulberry.]—8vo, xlii+262 pp. Padua, R. Stazione Bacologica Sperimentale, 1927. [3,850 titles by authors, with subject-index.]

ROBINSON (R. H.). **Spray Residue Removal from Waxy Fruit.**—*Better Fruit*, xxii, no. 12, p. 12. Portland, Oregon, June 1928.

After a certain amount of wax had formed on the fruit, it was found impossible to remove spray residue below ·01 grain arsenious oxide per lb. by treatment with hydrochloric acid at or near 70° F. Higher temperatures accelerate the solvent action of the acid and tend to soften the wax. Tests made with the acid at 100–105° F., although showing far better results than at ordinary temperatures, were not uniform. Efforts should therefore be made to harvest the fruit at the proper time and to wash it before wax forms, using warmer acid where washing has been delayed.

HEALD (F. D.), NELLER (J. R.) & OVERLEY (F. L.). **Spray Residue Removal from Washington Apples and Pears during 1927 Season.**—*Better Fruit*, xxii, no. 12, pp. 15–17 & 32. Portland, Oregon, June 1928.

This paper discusses the results of investigations dealing with the efficiency of eight wet and five dry process machines and the effect of cleaning upon the storage life of apples and pears.

WOGLUM (R. S.) & others. **Handbook of Citrus Insect Control for 1928.**—*Bull. California Fruit Gr. Exch.*, no. 5, 36 pp. Los Angeles, Cal., July 1928.

The various proprietary insecticides used against pests of *Citrus* in California during the season 1927–28 are discussed and compared [*cf. R.A.E.*, A, xv, 603].

MILLER (R. L.). *Telenomus megacephalus*, **Ashm., an Egg Parasite of the Green Pumpkin Bug,** *Nezara viridula*, **Linn., in Florida.**—*Florida Ent.*, xii, no. 2, pp. 17–20. Gainesville, Fla., June 1928.

The eggs of the commoner Pentatomids in Florida, particularly *Nezara viridula*, L., *Euschistus servus*, Say, and the predator, *Euthyrhynchus floridanus*, L., are attacked by the Scelionid, *Telenomus megacephalus*, Ashm. The method of parasitism as occurring in captivity is described, one parasite ovipositing in one after another of the Pentatomid eggs until the entire mass is parasitised. The first adults from these eggs appeared in about 3 weeks, the entire life-history of the parasite occupying about 23 days. The adult parasites are quite active immediately after emergence and pair almost at once.

BRUNER (S. C.). **Sobre la solucion del problema de la mosca prieta** [*Aleurocanthus woglumi*].—*Rev. Agric. Com. Trab.*, ix, no. 7, pp. 38–40. Havana, January 1928.

Aleurocanthus woglumi, Ashby, has become a serious pest of *Citrus* in Cuba since its introduction about 1914. Disadvantages attaching to the use of oil emulsions and of entomogenous fungi, such as *Aschersonia aleurodis* and *Aegerita webberi*, are briefly discussed, and it is suggested that the introduction of Chalcid parasites would solve the problem. The species indicated are *Prospaltella smithi*, Silv., found in Ceylon and China; *P. divergens*, Silv., in India; *P. ishii*, Silv., in China; and *Encarsia merceti*, Silv., in India and the Philippines. Of these, the first is the most important.

[**Froghopper Investigations.**]—*Min. & Proc. Froghopper Invest. Comm., Trinidad & Tobago*, pt. xi, pp. 1–35. Trinidad, 1928.

Experiments showed that eggs of the froghopper [*Tomaspis saccharina*] are killed by 20 minutes' exposure to a temperature of 122° F. Tests were carried out to determine the effect on the hatching of nymphs of cyanogas calcium cyanide dusted on cut stools under conditions similar to those obtaining on sugar estates in the dry season. The results are considered sufficiently encouraging to merit a trial in the field. In experiments against nymphs in spittle, calcium fluosilicate stupefied the nymphs immediately after application, but all recovered, and the spittle mass was not broken up as with calcium cyanide; sodium fluosilicate killed only 4 nymphs out of some 90 treated with it. These substances are therefore much inferior to calcium cyanide against these nymphs.

A note on the dangers of dusting with calcium cyanide is contributed by W. Moore, and a summary of the data regarding froghopper incidence is compiled from observers' records by F. Hardy.

Taylor (T. H. C.). [**Report on Investigations in Trinidad on** *Liothrips urichi* **as a Parasite for** *Clidemia hirta*.]—*Legis. Council Paper, Fiji*, 5 pp. Suva, 1928.

In the hope of finding a means for the biological control of the melastomataceous shrub, *Clidemia hirta*, in Fiji, a study was carried out in Trinidad from November 1927 to January 1928. In Trinidad this plant is of no economic importance, being controlled by climatic conditions, such as comparative lack of humidity, the pressure of other vegetation, and insects. Of the latter *Liothrips urichi*, Karny, appears to be the only one suitable for introduction into Fiji, provided that it can be proved not to attack plants of economic importance. The leaf-rolling Lepidoptera also found attacking *C. hirta* occur on nearly all species of *Miconia* and *Clidemia*, and are not sufficiently common even in Trinidad to play any part in the control of the plant. A list is given of 21 species of melastomataceous plants found in Trinidad. An unidentified moth, probably a Gelechiid, was found commonly attacking and confined to *C. pustulata* in close proximity to *C. hirta*.

L. urichi, which occurs throughout Trinidad on *C. hirta*, is said to be more common in the dry season, though found to be prevalent in the wet, and appears to avoid plants in very deep shade. It causes brown spots on the leaves, which finally turn black and drop, the whole shoot eventually dying. A preference is shown for young shoots, all of which may be destroyed on a bush, while the older leaves remain healthy. Though rarely killed by the thrips alone, attacked plants become stunted, flower very little, and easily succumb to drought, etc.

Laboratory studies show that the eggs are usually laid on the lower surface of the youngest leaves, or in the angles between the petioles and the terminal buds, and hatch in 8–9 days. The nymphs begin feeding on the lower surfaces of the leaves, but after 4 or 5 days, when the first moult occurs, they often move down the stem and feed there, frequently attacking the petioles and causing the leaves to drop off. No further growth occurs after the second moult (10–12 days after hatching), and neither prepupal nor pupal stage is capable of taking nourishment. These stages last 1 day or less and 5–6 days, respectively. The adults remain quiescent for a day or two after emergence, and then begin feeding voraciously. Oviposition begins about 6 days after emergence. A Chalcid, *Tetrastichus thripophonus*, Wtrst., has been bred from the prepupae, but was not found by the author. No other natural enemies are known.

Box (H. E.). [**Report for 1927 of the Department of Entomology of the Tucumán Agricultural Experiment Station.**]—*Rev. ind. agric.*, xviii, no. 9–10, pp. 162–172, 5 pls., 2 figs., 5 refs. Tucumán, February–March 1928.

Diatraea saccharalis, F., is the chief pest of sugar-cane in the province of Tucumán, Argentina. Its natural enemies and the influence on it of different varieties of cane are discussed [*R.A.E.*, A, xvi, 331, 404]. Another moth-borer, *Elasmopalpus lignosellus*, Zell., occurs throughout the province, sometimes doing considerable damage. *Trionymus* (*Pseudococcus*) *sacchari*, Ckll., was an important pest of cane in 1927.

Citrus was attacked by the Aphid, *Toxoptera aurantii*, Boy., and the Coccids, *Lepidosaphes beckii*, Newm., *Chrysomphalus ficus*, Ashm. (*aonidum*, auct.), *C. dictyospermi*, Mask., *C. minor*, Berl., and *Pinnaspis* (*Hemichionaspis*) *aspidistrae*, Sign. Cotton pests included *Alabama argillacea*, Hb., and *Aphis gossypii*, Glov. The Membracid, *Ceresa brunnicornis*, Fairm., was the only pest of lucerne observed in abundance. Cabbages were infested by *Plutella maculipennis*, Curt.

Verslag van den Phytopatholoog. [Report of the Phytopathologist.]—*Versl. Dept. Landbouwproefst. Suriname, 1924–1927*, pp. 22–26. Paramaribo, 1928.

Cotton in Dutch Guiana is constantly attacked by leaf-eating caterpillars, especially *Alabama argillacea*, Hb., which can be controlled by spraying with Paris green, and by *Dysdercus* spp., which are more serious and against which no really effective measure has been found. The numbers of *Aphis gossypii*, Glov., on cotton and of *Oregma* sp. on sugar-cane are kept down by the Coccinellids, *Ceratomegilla* (*Megilla*) *maculata*, DeG., and *Cycloneda sanguinea*, L. Other sugar-cane pests are *Aphis sacchari*, Zehnt., which is of little importance and *Diatraea* spp. Bugs, especially *Mormidea ypsilon*, L., injure the rice-crop.

Balachowsky (A.). **Contribution à l'étude des coccides de l'Afrique mineure. 2e note.**—*Bull. Soc. Hist. nat. Afr. N.*, xix, no. 3, pp. 121–144, 3 pls., 20 refs. Algiers, March 1928.

A description is given of 6 new North African Diaspine Coccids, including *Aspidiotus* (*Hemiberlesia*) *ceardi*, sp. n., on fig (*Ficus carica*), together with keys to the species of *Hemiberlesia* and *Leucaspis* in North Africa and an additional list of North African Coccids [*cf.* *R.A.E.*, A, xvi, 200].

COTTERELL (G. S.). **Cotton Pests of Southern British Togoland and Trans-Volta District.**—*Bull. Dept. Agric. Gold Coast*, no. 12, 42 pp., 4 pls., 1 map, 4 graphs, 11 refs. Accra, April 1928.

A detailed account is given of a survey of the actual and potential cotton-growing areas in British Togoland and in the Trans-Volta Region of the Gold Coast Colony, with notes on all the pests of cotton observed. The chief ones are *Dysdercus superstitiosus*, F., *Earias biplaga*, Wlk., and *E. insulana*, Boisd. The larvae of the Eumolpid, *Syagrus calcaratus*, F., are recorded for the first time as attacking cotton in Togoland, serious damage being done to the roots of exotic cottons and to a less extent to native cottons. It is assumed that no loss of crop occurs following insect attacks on buds or bolls unless a very high percentage is injured, since extensive shedding of both takes place naturally and is of a selective nature. Abortion of one or more locks and staining of lint are the result of internal boll disease, which gains ingress to the bolls through the punctures of *Dysdercus*. The percentage of damaged bolls in various localities is given. The baobab, *Adansonia digitata*, is the most important alternative food-plant of *D. superstitiosus* owing to its prolonged fruiting period and the length of time that the fruits remain on the trees ; others are *Eriodendron*, *Bombax* and *Hibiscus esculentus*. Cotton plants that are not destroyed at the end of the season are also important in carrying the stainer over from one season to another, since some bolls are available throughout the non-cotton period. These plants also commence to flower and fruit in quantity earlier in the following season than the newly planted cotton, and this results in the early attraction of adult stainers and their consequent earlier spread to annual cotton in the vicinity. In one region there is a migration to cotton that corresponds with the first period of maximum flowering. The breeding of stainers on cotton ceases after the commencement of the dry season, owing to the aridity of the fields, and does not begin again until late in the season. In another region there is no migration, and this is believed to be due to the late flowering of cotton in this district and fruiting commencing after the dry season has begun. For this reason the stainers are considerably less numerous throughout the season. Traps for stainers are not likely to be successful, and control measures consist in the production of late fruiting cottons, the removal of baobab trees where practicable and the destruction of cotton at the end of the season. At present there is no practical remedy for bollworm injury.

Textes concernant la police sanitaire végétale en Indochine.—*Bull. écon. Indochine*, xxxi, Renseignements, pp. 291–309. Hanoi, April 1928.

The text is given of various decrees that have been promulgated during 1927 and 1928 regulating the introduction of plants and products into Indo-China with a view to preventing the entry of insect pests and diseases.

TAMANUKI (K.). **Studies on** *Galerucella rubi*, **Tamanuki, sp. n.** [*In Japanese.*]—*Res. Bull. Dept. Agric. & For., Govt. Sakhalin*, no. 1, pp. 1–19. Toyohara, Sakhalin, July 1928.

In southern Sakhalin *Galerucella rubi*, sp. n., infests the young leaves of strawberry plants in both the larval and adult stages. Hibernation takes place in the adult stage, the beetles occurring from the end of May to October and the larvae from the end of June to the end of July. The eggs are laid in groups on the lower surface of the leaves in the evening or early morning. One female may lay as many as 100 in several groups, each group containing about 19. The first instar larvae are gregarious. Complete development takes 26–29 days; the pupal stage lasts 4 or 5 days. The eggs and larvae are destroyed by Coccinellids. Spraying with a soap solution alone or mixed with derris is recommended for control.

KANBE (T.). **On Collecting Experiments with the Pink Bollworm by the Purple Light-trap.** [*In Japanese.*]—*Rep. Agric. Expt. Sta. Korea*, iii, no. 4, pp. 260–269. Suigen, Korea, August 1928.

In an experiment in which different light-traps were used, 70·4 per cent. of the moths of the pink bollworm [*Platyedra gossypiella*, Saund.] were collected by a purple light, 17·5 by a white light, 10·3 by a green and 1·8 by a red. The moths were mostly caught between 1 and 3 a.m. from July to September, and on an average 46·2 per cent. were females.

KATO (M.). **On Homopterous Insects infesting Mango.** [*In Japanese.*]—*Formosan Agric. Rev.*, xxii, pp. 47–52. Taihoku, Formosa, August 1928.

The leaves and branches of mango trees in Formosa are infested by the Psyllid, *Pauropsylla nigra*, Crawf., the Jassids, *Idiocerus niveosparsus*, Leth., *Ledra auditula*, Wlk., and *Tartessus nigricosta*, Mats. and the Tropiduchid, *Ossa dimidiata*, Motsch. Descriptions are given of each, with brief notes on their biology.

JARVIS (H.) & WATSON (S. M.). **Dusting versus Spraying as a Control for Codling Moth in the Stanthorpe District.**—*Queensland Agric. J.*, xxix, pt. 5, pp. 340–345. Brisbane, 1st May 1928.

Since the results obtained from spraying with lead arsenate against the codling moth [*Cydia pomonella*, L.] in the Stanthorpe District in Queensland have been disappointing, an experiment was undertaken to compare the cost and efficacy of dusting with a mixture containing 15 per cent. lead arsenate. Four treatments were made with the dust; the intervals between the applications were 9, 17 and 46 days, the first coinciding with the usual calyx spray. Only three spray treatments were given, at intervals of 8 and 62 days, the first application being the calyx spray. The results indicate that *C. pomonella* can be satisfactorily controlled with this dust and that the increased cost of the dust is more than equalised by the great saving in time and labour. The quickness of application should prove of much value when the trees have to be treated at critical or unusual times, and another advantage is that the dust is carried by the air right into the trees, and thus covers almost every portion. In spite of almost continuous wet weather, traces of both dust and spray were found on the fruit at the time of picking.

Showell (H.). **A useful Parasite of the Dried Fruit Moth.**—*J. Dept. Agric. S. Aust.*, xxxi, no. 11, pp. 1048–1056, 5 figs. Adelaide, 15th June 1928.

Plodia interpunctella, Hb., is the most destructive pest of dried fruit in South Australia. The life-cycle, which is determined largely by temperature, requires about six weeks in summer, and there are 2 or 3 generations in the season. The larvae hibernate during cold weather, but at suitable temperatures breeding may be continuous. Generally, there are three periods of infestation of dried fruit: a light one in late October or early November, a heavier one in December, and a third and more severe one in early autumn. *Microbracon hebetor*, Say (*juglandis*, Ashm.) has recently been observed parasitising the larvae. There are apparently eight generations of this Braconid in a season. Females emerging in March or April hibernate through the winter, becoming active if warmed or disturbed; larvae of the fruit moth were stung fairly frequently during the winter, but no eggs were deposited. No males survived the winter in captivity, and some of the females died also. They appear to require some moisture during hibernation. The life-cycle varies with the temperature, 16 days being sufficient during the summer, with temperatures from 60 to over 100° F. The manner of parasitism is described. The parasite first stings the larva, and then returns later to oviposit in its body. Many of the paralysed larvae do not have eggs deposited in them, but their vital functions gradually slow down and the larvae wither; moreover, the other moth larvae freely devour those that have been paralysed. If too many eggs are laid on one host, the resulting larvae pupate successfully, but the adults are undersized; the usual number of eggs is from 2 to 5 on one host, but as many as 14 have been counted. If oviposition has not occurred in from 7 to 9 days after paralysing of the host, it does not take place in that individual. Breeding experiments indicate that a normal brood from a fertilised female consists of a large excess of females, but unfertilised females produce only males. Probably the hibernating females are unfertilised and their first offspring entirely male. In South Australia there seems to be some factor restricting the numbers of the parasite, perhaps a hyperparasite or the very dry atmosphere.

Averna-Saccá (R.). **Sobre a presença de um protozoario nos tecidos da canna de assucar, atacados pelo "Mosaico."** [On the Presence of a Protozoan in the Tissues of Sugar-cane attacked by Mosaic.]—*Bol. Agric.*, xxvii, no. 6–7, 8–9, 10, 11–12, pp. 183–204, 252–273, 303–319, 388–398, 21 figs., 110 refs.; xxviii, no. 2–3, pp. 173–182. S. Paulo, June–December 1926, February–March 1927.

The literature on mosaic disease and on flagellate infections of plants is briefly reviewed. When studying tobacco mosaic in the Dutch East Indies, Palm found corpuscles, apparently protozoa, which he named *Strongyloplasma iwanocoski*, in many diseased cells. The author has found these in Brazil in tobacco attacked by mosaic, and similar bodies have been found in sugar-cane infected with mosaic in the West Indies. In studying sugar-cane mosaic in Brazil the author found that as the stem grows the corpuscles tend to concentrate in the terminal portion, which is the part used for planting. In a section on the vectors of sugar-cane mosaic, while not denying the agency of Aphids such as *Aphis maidis*, Fitch, the author draws attention to *Diatraea saccharalis*, F., and *Pseudococcus boninsis*, Kuw. (*calceolariae*, auct.) on cane, and to the flea-beetle, *Epitrix parvula*, F., on tobacco, as in the infections observed in Brazil, Aphids were either rare or entirely absent. Crop-rotation is considered necessary to keep the soil free from toxins that may be a factor as regards mosaic, and a study of the relation, if any, between soil-acidity and mosaic is suggested.

VIZIOLI (J.). **As pragas mais communs dos cannaviaes paulistas.** [The more common Pests of Sugar-cane Fields in S. Paulo.]—*Bol. Agric.*, xxvii, no. 11–12, pp. 414–420. S. Paulo, November–December 1926.

Diatraea saccharalis, F., is the chief pest of sugar-cane in S. Paulo. *Pseudococcus boninsis*, Kuw. (*calceolariae*, auct.) is fostered by ants and does little harm where they are absent. It is suggested that *Pseudococcobius terryi*, Fullaway, might be imported from Hawaii against it.

VIZIOLI (J.) & MEYER (A. C.). **O combate ao cupim e o tratamento das mudas de canna com o "Uspulun."** [Measures against Ants and the Treatment of Cane Slips with Uspulun.]—*Bol. Agric.*, xxix no. 1–2, pp. 23–35, 2 figs. S. Paulo, January–February 1928.

Ants are a serious pest of planted cane slips in Brazil. A weak poison-syrup [*R.A.E.*, A, viii, 285] did not give satisfactory results. A method of planting that prevents the attacks of ants consists in using shoots instead of the usual slips. To do this the terminal shoots of a cane plant are cut off, thus inducing the growth of lateral shoots. Such a shoot, 6–8 inches long, is removed for planting by cutting a section of the cane just above and below the knot where the shoot grows. The soil should be quite moist at the time of planting.

[PRINTZ (Ya I.).] **Принц (Я. И.). Notes on Vine Pests. II.** [*In Russian.*]—*Entom. Kab. Koop. vinogr. Helenendorf*, 126 pp., 3 figs., 3 charts, 4 graphs, 15 refs. Tiflis, "Konkordiya" 1928.

A detailed account is given of some of the more important vine pests as a result of three years' observations in Transcaucasia during 1925-28. Recent foreign literature on the susceptibility of different varieties of vines to *Phylloxera* and the resistance of various stocks is reviewed at length, and its distribution and biology in the Caucasus [*R.A.E.*, A, xv, 125, 372], where only one form, *P. vastatrix*, Planch., seems to occur, is discussed. The duration of the first four generations is fairly constant, the subsequent ones varying according to temperature conditions. During 1927 as a result of the warm autumn, seven generations occurred, oviposition continuing throughout October, while in 1926 hibernation began in September and no eggs were found after that month. Owing to the late oviposition in 1927, the eggs were not all able to hatch, so that they were frequently found during the winter of 1927–28.

It was found that the limits of an infestation may be ascertained by an examination of the top young roots, as these are always injured first. The radial distribution depends largely on the type of soil, the conditions of its surface and the amount of humidity. Migration along the cracks below the soil surface occurs from the end of April to late autumn among the newly emerged larvae and among the other stages when seeking a fresh place on the root for feeding. This type of migration occurs mainly in old, widespread infestations. From the second half of July to the end of August, the true migrants come to the soil surface and infest fresh plants. They emerge through the cracks near the plant and crawl up the stem. Though Mordvilko [*R.A.E.*, A, xiv, 195] considers that the Aphids can only emerge through the cracks by climbing along the roots, the present observations have shown that they can move equally well on a rough surface, such as sand, provided that it is not loose, so that they can get a hold. As the Aphids are able to move along the cracks, any method intended to prevent their emergence near the stem of the plant loses its value. Contrary to previous theories it has been found that *Phylloxera* can exist and develop in sandy soils, though it must eventually die out as it is unable to move about in the loose soil.

Experiments with soil fumigants [xv, 125] have been continued and extended to include paradichlorobenzene. This alone did not produce a sufficiently high mortality, but when it was combined with carbon bisulphide in varying proportions, excellent results were obtained, as the Aphids in the deeper layers of the soil were killed by the carbon bisulphide and those in the upper layers by the paradichorobenzene.

A detailed account is given of the observations on the bionomics of *Polyphylla olivieri*, Lap. [*cf.* xv, 126]. Laboratory observations indicate that the life-cycle may extend even longer than three years. During 1927 265,000 beetles were collected. The feeding of the larvae and their movement in the soil under varying conditions is discussed. The eggs are laid in batches of 3–8 at a depth of 2–4 inches, and under laboratory conditions they hatch in 22–25 days. In 1925 the first eggs were found at the beginning of August, mainly in the irrigation channels. The larvae remain at the point of hatching until November, and as the weather gets colder they descend to a depth of 10–12 inches, returning nearer the surface in the following spring. Pupation occurs from the end of May to the beginning of July.

The importance of collecting the larvae and adults [xv, 126] is pointed out, and experiments with carbon bisulphide are described in detail. One, two or three parts of this material were also used in combination with one part of paradichlorobenzene. The fumigant should be used at the rate of 2 oz. to the square yard during the first half of April or at the end of October. To protect young slips the ground should be treated with carbon bisulphide alone or in combination with paradichlorobenzene, followed by the application of paradichlorobenzene at the rate of $\frac{1}{3}$ to $\frac{1}{2}$ oz. around each slip at a distance of about 7 inches from it. This latter application must be repeated 3–4 times throughout the summer.

Against *Pseudococcus citri*, Risso [*R.A.E.*, A, xiii, 216; xv, 126] fumigation is not practicable under existing conditions, as the wire supports used for the vines interfere with the erection of the tents. During 1927 experiments were made with various emulsions for summer treatment, which is considered more satisfactory than winter treatment. The best results were obtained with kerosene and lime, with the addition of either cotton or seal oil. The spray should be carefully and thoroughly applied in July, when the first individuals appear on the leaves.

NOWICKI (S.). **Eine neue** *Tyndarichus*-**Art,** *T. rudnevi* **n. sp., aus den Eiern von** *Cerambyx cerdo*, **L. (Hym., Chalcididae).** [A new Species of *Tyndarichus*, *T. rudnevi*, from the Eggs of *C. cerdo*.]—*N. Beitr. syst. Insektenk.*, iv, no. 3–4, pp. 17–27, 4 figs., 6 refs. Berlin, 25th July 1928.

The Encyrtid, *Tyndarichus rudnevi*, sp. n., is described from eggs of *Cerambyx cerdo*, L., in Ukraine. The percentage of parasitism is usually about 5, but may rise to 35 in centres of infestation by the Cerambycid. Several larvae occur in one egg of the host.

[TROITZKIĬ (N. N.).] **Троицкий (Н. Н.). The simplest Hydrostats for Experimental Work on the Ecology of Insects.** [*In Russian.*]—*Morbi Plantarum*, xvi (1927), no. 3–4, pp. 165–172, 5 figs. Leningrad, 1928.

A simple hydrostat is described and illustrated. It consists of two chambers built one over the other, the upper one having glass walls, a perforated floor and ventilators at the top. The air enters the lower chamber, its admission being regulated by shutters, and is warmed by electric lamps. The humidity content may be increased by placing evaporators with filter paper near the lamps. The warmed air rises through the upper chamber, the humidity and temperature in which are thus regulated. By making the glass walls double, with an air space between them, loss of heat may be diminished.

GEORGIEFF (I.). **Der Heu-und Sauerwurm in Bulgarien.** [The Spring and Summer Generations of the Vine-moth in Bulgaria.]—*Nachr. SchädlBekämpf.*, iii, no. 2, pp. 42–45. Leverkusen a. Rh., June 1928.

During the past six or seven years, *Polychrosis botrana*, Schiff., has become an important pest throughout the vine-growing districts of Bulgaria, which have a subtropical climate very favourable to it. During the observations described the flight-periods of the three generations were 26th April–10th May, 26th June–7th July, and 10th–16th August, respectively. *Clysia* (*Conchylis*) *ambiguella*, Hb., has not been observed in Bulgaria.

[RUSKOV (M. D.).] **Русков (М. Д.). Some injurious Insects found in the Forests of Bulgaria in 1927.** [*In Bulgarian.*]—*Mitt. bulgar. ent. Ges.*, iv (1927), pp. 57–64. Sofia, 1928. (With a Summary in German.)

This is a list of 64 forest pests recorded during 1927, with notes on their local distribution and food-plants. Fifteen-year-old trees of *Pinus ponderosa* transplanted in the spring were seriously attacked by *Pissodes notatus*, F., and *Ips erosus*, Woll. (*Tomicus rectangulus*, Eichh.) and died in August. *Carphoborus minimus*, F., attacked pole wood on the ground and young standing trees of *Pinus strobus*, causing the death of the latter.

[Chorbadzhīev (P.).] **Чорбаджиевъ (П.). Entomoscelis adonidis, Pall., in Bulgaria.** [*In Bulgarian.*]—*Mitt. bulgar. ent. Ges.*, iv (1927), pp. 65–90, 5 figs., 3 refs. Sofia, 1928.

This is a general account of the biology and control of the Chrysomelid, *Entomoscelis adonidis*, Pall., in Bulgaria.

[Chorbadzhīev (P.).] **Чорбаджиевъ (П.). Notes on some injurious Insects in Bulgaria recorded in 1926 and 1927.** [*In Bulgarian.*]—*Mitt. bulgar. ent. Ges.*, iv (1927), pp. 125–134, 5 refs. Sofia, 1928.

This is a list of 45 injurious insects recorded during 1926 and 1927 in Bulgaria, showing their local and seasonal distribution and food-plants.

Klein (H. Z.). **Beitrag zur Kenntnis von *Ocnogyna loewi*, Z. (Lep.).** [A Contribution to the Knowledge of *O. loewi*.]—*Z. wiss. Insekt-Biol.*, xxiii, no. 5–7, pp. 144–150, 3 figs. Berlin, 25th July 1928.

The larvae of the Arctiid, *Ocnogyna loewi*, Zell., develop in Palestine on weeds in desert lands from which they occasionally reach neighbouring cultivated ground. The chief injury observed was to tobacco, vines and beet. As a rule the damage is slight but widespread. A long list of the food-plants is given. The adults appear in December. The eggs are laid on the ground near weeds in uncultivated places and begin to hatch early in February. In general the larval period lasts 6–8 weeks, and the pupal stage, which occurs in the ground, 8 months. A heavy mortality from disease occurs in both larval and pupal stages, and the Braconid, *Apanteles congestus*, Nees, was bred in March from the larvae.

Pohl (L.). **Zur Biologie des Messingkäfers (*Niptus hololeucus*, Fald.) (Col., Ptil.).** [A Contribution to the Biology of *N. hololeucus*.]—*Z. wiss. Insekt Biol.*, xxiii, no. 5–7, pp. 150–159, 6 figs., 4 refs. Berlin, 25th July 1928.

The larva and pupa of *Niptus hololeucus*, Fald., are described, and an account of the biology of this Ptinid is given from breeding experiments in Silesia and from the literature. The adults are polyphagous and have a preference for woollen fabrics. They do not attack either sound or rotten wood. The larva requires substances containing starch ; it does not attack wood. When the oviposition period arrives, the beetles come into the open to seek places for oviposition where the larvae can find the necessary starch and are thus easy to destroy. Damp rags are useful traps. The eggs are laid in floors where grain has been stored, etc., and hatch in about 2½ weeks. The larval stage lasts 60 days. Pupation takes place in a chamber in soft material, such as rotten wood or wood damaged by xylophagous insects. If such a shelter is not available, pupation occurs in a loose cocoon, but this seems unfavourable to development. There appear to be two generations a year in Silesia, the adults being plentiful in June–July and October–November.

ZWÖLFER (W.). **Einige Beobachtungen über das Auftreten der Kornmotte** (*Tinea granella*, **L.**) **an gelagerten Maiskolben.** [Some Observations on the Maize Moth, *T. granella*, in stored Maize Cobs.]—*Mitt. Ges. Vorratsschutz*, iv, no. 4, pp. 43–45, 1 fig. Berlin, July 1928.

Tinea granella, L., appears to have two generations a year in Baden. Infested maize cobs, taken from store and placed in glass cylinders in July, yielded adults in August. Adults occurred throughout September, and larval injury followed up to the end of October, when the larvae began spinning cocoons. The glasses were kept at about the temperature of the store-room. Early in April adults appeared again in the glasses. Their large numbers and other circumstances preclude the possibility of their being stragglers of the first generation.

KAUTSCH (M.). **Rückblick auf die Borkenkäferkatastrophe 1919 bis 1923 in den Reichraminger Fondsforsten, mit einem Mahnwort von Karl Fritz.** [A Retrospect on the Bark-beetle Outbreak of 1919–23 in the Reichraming Valley, with a Warning by Karl Fritz.]—*Wiener allgem. Forst- u. Jagdztg.*, xlv, pp. 165–167. Vienna, 1927. (Abstract in *Neuheiten PflSch.*, 1928, no. 1, pp. 15–16. Vienna, 1928.)

The most important bark-beetle outbreak in Europe occurred in 1919–23 in the Reichraming valley, Austria, where 24½ million cu. ft. of exploitable spruce were left standing past the admissible felling age, thus providing favourable conditions for *Ips* (*Tomicus*) *typographus*, L., which were increased by ice, snow and wind-breaks. In 1922 no less than 80,000 larvae, pupae and adults were counted in one stem. The ground was cleared at great expense and replanted with a pure stand of spruce. In his note, Fritz emphasises the advisability of mixed stands.

KÖBELIN (J.). **Der Engerling des Maikäfers als Rebschädling.** [The Larva of the May-beetle as a Pest of Vines.]—*Weinbau u. Kellerwirtschaft*, 1927, no. 4, p. 84. (Abstract in *Neuheiten PflSch.*, 1928, no. 1, pp. 17–18. Vienna, 1928.)

Injury to vines by larvae of *Melolontha* in the Kaiserstuhl district on the Rhine is very severe, as many as 30 larvae being found within a depth of 12 inches and an area of 11 sq. ft. Injury may be decreased by leaving the trenches open during the summer, the vines being covered to a depth of only 6–8 inches. Fumigation with carbon bisulphide is ineffective in spring, when the larvae are at a depth of up to 3 ft., but at the proper time it reduces the injury to negligible proportions.

Müller (K.). **Reblausimmunität und Brauchbarkeit der Unterlagsreben für deutsche Verhältnisse.** [Immunity from *Phylloxera* and the Value of Grafting Stocks under German Conditions.]—*Mitt. deuts. Landw.-Ges.*, 1928, St. 15, reprint 2 pp. Berlin, 1928. (Abstract in *Centralbl. Bakt.*, (2) lxxv, no. 8–14, pp. 317–318. Jena, 23rd July 1928.)

The author disputes the value at the present time in Germany of Börner's researches on immunity of certain vines from *Phylloxera.* In other countries with warmer climates, where *Phylloxera* has therefore been able to spread rapidly, success has attended the use of suitable stocks without regard to biological races of *Phylloxera* or to the absolute immunity of the stocks. Suitable stocks are available in Germany and should be utilised for the present.

W. (R.). **Die Kirschblütenmotte** (*Argyresthia ephippiella*, **F.**), **ein wichtiger, aber wenig bekannte Kirschenschädling.** [The Cherry Blossom Moth, *A. ephippiella*, an important but little known Cherry Pest.]—*Schweiz. Z. Obst- u. Weinb.*, xxxvii, no. 15, pp. 256–261, 3 figs. Wädenswil, 21st July 1928.

In the Swiss Jura districts *Argyresthia ephippiella*, F., destroyed over 60 per cent. of the cherry blossoms in 1927–28; allowing for natural loss, any infestation over 30 per cent. is considered harmful. The first adults appear in mid-June, and in 1927 the last captures were made on 13th September. This long flight period is that of one generation; there is a long egg-maturing period during which the moths feed on nectar in the blossoms. It may, therefore, be possible to devise bait-traps for use before oviposition begins in mid-July. The eggs are laid in minute cracks in the bark of the branches and hatch in the following spring when the buds begin to swell, the larvae eating their way into the interior. Early in May they let themselves down to the ground, in which they pupate in cocoons. Early-blossoming cherries suffer most, and the injury is greatest in places near mixed forests containing such food-plants of *A. ephippiella* as hazel, *Crataegus*, etc. A winter spray of 8 per cent. fruit-tree carbolineum will destroy many of the eggs and should be followed by a 2 per cent. lead arsenate spray against the larvae when the buds are swelling. Digging up the ground beneath the trees and then stamping it down prevents the emergence of the moths.

Lindblom (A.). **Orienterande jämförande försök med insektbekämpningsmedel.** [Investigations on Insecticides.]—*Meddel. Centralanst. försöks. jordbruks.*, no. 330, Lantbruksent. avdel. no. 53, 33 pp., 12 figs., 8 tables. Stockholm, 1928. (With a Summary in German.)

This paper describes tests of various insecticides on *Pieris brassicae*, L. The first series dealt with proprietary contact insecticides, some of which contained nicotine, against the eggs. Nicotine has about equal efficiency whether pure or as a sulphate, provided that it is not influenced by other components of the mixture. Pure nicotine does not adhere well, and an adhesive that does not lower its insecticidal power must be combined with it.

In the second series of experiments, proprietary contact insecticides were used against the larvae. A mortality of 100 per cent. was attained with 0·75 per cent. of soft soap. In the third series, various arsenicals were used. For a given unit of weight great differences in efficiency were noted, depending on ingredients other than arsenic in the preparation.

THEOBALD (F. V.). **The Value of Tar-Distillate Washes.**—*J. Kent Fmrs'. Union*, xxii, no. 4, reprint 4 pp. Maidstone, October 1927.

This brief review of the situation in regard to the employment of tar-distillate washes in orchards shows that winter applications at 7 per cent. strength destroy the eggs of most Aphids attacking fruit trees, and are also effective against Coccids, *Psylla mali*, Schmidb., etc. Some insects, including Capsids, leafhoppers, and certain Lepidoptera, are only partly controlled. Even at 10 per cent. these washes are sometimes ineffectual against *Cheimatobia brumata*, L., and certain other moths, for the control of which the author urges the continuance of the practice of grease banding and spring spraying with nicotine soap. Insects that are entirely unaffected by spraying with tar distillates include the apple blossom weevil [*Anthonomus pomorum*, L.], the apple fruit sawfly [*Hoplocampa testudinea*, Klug] and the pear midge [*Contarinia pyrivora*, Riley].

GOODWIN (W.) & MARTIN (H.). **Bordeaux Mixture in combination with Arsenical Sprays.**—*J. Agric. Sci.*, xviii, pt. 3, pp. 460–477, 18 refs. Cambridge, 26th July 1928.

The following is the authors' summary: The interaction of Bordeaux mixture with lead arsenate and with calcium arsenate has been studied by an examination of the effects which are produced when hydrated lime is added to the arsenical compounds and when copper sulphate is added to the combinations. The nature of the interaction of calcium hydroxide and diplumbic hydrogen arsenate has been shown to be most complex and to result in the complete decomposition of part of the lead arsenate and the formation of basic calcium arsenates.

Support is not given to the view that calcium carbonate decomposes diplumbic hydrogen arsenate with the production of soluble arsenic compounds. When lead arsenate, in water, is allowed to interact for long periods with excess of hydrated lime, the amount of basic calcium arsenates formed is such that large quantities of arsenic are brought into solution by the action of carbon dioxide. Under conditions when the calcium hydroxide is rapidly converted to the carbonate the amount of arsenic rendered soluble is slight.

The conclusion is formed that in actual spraying there is a definite reduction of the risk of arsenical injury when hydrated lime is added to lead arsenate and to calcium arsenate. It is concluded that when the conditions are such that the addition of hydrated lime brings about a reduction of arsenical injury, the use of an "equal-lime" Bordeaux mixture containing an equivalent amount of calcium hydroxide will prove far more effective.

THEOBALD (F. V.). **The Nut Bud Tortrix** (*Epiblema penkleriana*, **Schiff.**).—*J. S.-E. Agric. Coll. Wye*, no. 25, pp. 68–70, 1 fig., 1 ref. Wye, Kent, 1928.

The larvae of *Eucosma* (*Epiblema*) *penkleriana*, Schiff., though mainly attacking wild hazel and occurring also on alder and oak, seriously damaged a plantation of cob-nuts in Surrey in 1926. The whole fruiting shoots were killed and the year's crop ruined. The larvae eat into the buds, apparently in late winter or early spring, female flower buds and catkins being also invaded. They continue to feed until late in May on the leaves, which they spin together; they then go down to the soil and pupate in delicate cocoons, coated with particles of earth. Adults emerge from 5 to 8 weeks later. Larvae of *Tortrix corylana*, F. (nut tortrix), which seldom do damage, also occurred in small numbers. Both these moths and the larva and pupa of the latter are described.

Spraying with tar distillate, which at a strength of 7½ per cent. was used in mid-January without harming the catkins, is suggested as a remedial measure should it be proved that the young larvae enter the buds in the late winter or early spring.

THEOBALD (F. V.). **The Rosy Rustic Moth** (*Hydroecia micacea*, **Fab.**) **as a Hop Pest.**—*J. S.-E. Agric. Coll. Wye*, no. 25, pp. 71–74, 2 figs., 3 refs. Wye, Kent, 1928.

Gortyna (*Hydroecia*) *micacea*, Esp., which is a pest of a variety of plants including potato and tomato, is recorded as attacking hops in Kent. All its stages are described. The young caterpillars feed on the tufts of the young leaves in May, spinning them together, then tunnel into the shoot near the apex, working down the bine as they grow. Those that fall to the ground may attack the plant lower down. Pupation takes place during July in a cell in the earth and lasts from 4 to 7 weeks, a few adults emerging as late as October. Sweet baits and light readily attract the moths, which fly at dusk.

THEOBALD (F. V.). **The Large Cabbage White Butterfly** (*Pontia brassicae*) **and a simple Method of Control.**—*J. S.-E. Agric. Coll. Wye*, no. 25, pp. 75–78, 3 figs. Wye, Kent, 1928.

An account is given of the bionomics of *Pieris* (*Pontia*) *brassicae*, L. Of the many old remedies for this pest the use of salt seems the only one of value. Dusts of dry salt mixed with various carriers had no marked effect, except in one case where salt and Fuller's earth was applied to wet broccoli. As a spray, however, 2 oz. of common salt to a gallon of water proved most satisfactory, though nasturtiums were scorched by it. An alcoholic solution of pyrethrum is also effective.

THEOBALD (F. V.). **Notes on a new Mushroom Pest and on the Control of** *Sciara* **Larvae.**—*J. S.-E. Agric. Coll. Wye*, no. 25, pp. 79–81, 2 figs. Wye, Kent, 1928.

BARNES (H. F.). **A Note on the new Cecid Pest.**—*Ibid.*, pp. 81–82, 1 fig.

Larvae of *Sciara agraria*, Felt, and of a Cecidomyiid, probably a species of *Miastor*, were found in Sussex heavily infesting mushrooms growing at an even temperature of about 60° F. in large sheds.

Two successive fumigations with hydrocyanic acid gas, used after the failure in April of sulphur dioxide, cleared a shed of the adults of *Sciara*, the Cecidomyiid not being present. By the end of July adults of *Sciara* were again numerous, especially during the final stages of the crop, and many larvae were found in the mushroom beds, there being also countless larvae of the Cecidomyiid in the mushrooms themselves and the spawn. Hydrocyanic acid gas was again employed in August, but had no effect on the larvae and pupae in the beds or mushrooms. The shed was then thoroughly cleaned and disinfected; and, after the beds had been remade in September and then capped, it was again fumigated. As a result only one adult *Sciara* was caught in October and no Cecidomyiid. In November, however, larvae of the latter were again numerous, as many as 70 feeding between the gills of a single small mushroom and from 10 to 20 being often found embedded in the flesh of the cap. These larvae rapidly multiply by paedogenesis (an account of this phenomenon being given in the second paper), and therefore do more damage than those of *S. agraria*. No means of controlling this Cecidomyiid, the adult of which is unknown, has yet been found. Many dry shrivelled larvae revived on being placed in warm damp peat moss; and in this way the midge may be distributed in the cakes of spawn. Both these pests enter the sheds with the manure.

Adults of *Sciara* were kept in check by trapping. Windows were covered inside with adhesive and outside with cheese cloth; and traps, made by spreading adhesive on glass plates painted white beneath, were laid along the ridges of the beds at intervals of from 12 to 20 ft. Spraying the roof, sides and floor of the shed with tar distillate before making up the beds was of some value. Turning the manure before bedding must destroy a large number of the larvae.

WIMSHURST (F. M.). **Preliminary Note on the Cherry Fruit Moth** (*Argyresthia nitidella*, **Fabr.**).—*J. S.-E. Agric. Coll. Wye*, no. 25, pp. 86–89, 4 figs. Wye, Kent, 1928.

Argyresthia nitidella, F., all stages of which are described, flies at sunset in late June or July in Kent and oviposits in the latter month under the scales and in old leaf scars and other crevices of the cherry. From late September to early March both mature eggs and newly hatched larvae can be found. As soon as the flower buds burst, and sometimes before, the young larva begins to feed on the petals and stamens, the yellow anthers of which it closely resembles. It then bores into the ovary, hollows it out and lies within it, its tail slightly protruding from the entrance hole. There it remains till mid-May, when it lowers itself by a silken thread and forms a cocoon in the soil, becoming adult in late June.

Only the eggs would be killed by a winter tar-distillate wash, the caterpillars being protected by closely woven webs. A soil insecticide used during the second or third week of May might kill the larvae as they reach the ground.

NEWTON (H. C. F.). **The Biology of Flea-beetles** (*Phyllotreta*) **attacking Cultivated Cruciferae.**—*J. S.-E. Agric. Coll. Wye.*, no. 25, pp. 90–115, 3 pls., 36 refs. Wye, Kent, 1928.

Fourteen species of *Phyllotreta* have been recorded as feeding on Cruciferae. Of the nine that cause great annual losses to agriculture, eight were studied in Kent, *viz.*, *P. nemorum*, L., *P. cruciferae*, Goeze, *P. atra*, Payk, *P. nigripes*, F., *P. undulata*, Kutsch., *P. consobrina*, Curt., *P. diademata*, Foudr., and *P. vittula*, Redt. A description of the eggs and larvae of these is given, as well as the technique of breeding experiments from which data on egg-laying and preference of food-plants were obtained.

A spell of hot weather at the end of April or during May and continuing intermittently till the end of June may result in whole fields of plants in the cotyledon stage being destroyed by the overwintered beetles. An earlier and doubly dangerous attack, which may pass unnoticed, occurs before the seedlings are through, the insects gaining access through the broken surface of the ground made by the upward thrust of the young seedlings and killing the plant by biting the hypocotyl. A decided preference is shown, in the later stage of the plant at least, for white turnip, radish and cabbage coming next, swede, kale and mustard last. It was noticed that cress, previously untouched, was badly damaged by beetles that were driven from other plants by spraying with nicotine sulphate.

Towards the end of September the young adults, having fed for some time, begin to hibernate deep down in tufts of grass, hedgerows, etc., and to a less extent under half buried weeds. Emergence takes place about the end of April or in May, mating then occurring and continuing during June. The variable period between the latter and egg-laying was not determined. The overwintered adults become scarce in July, but in the laboratory they lived through August. Only one generation a year was observed, the young beetles ovipositing after hibernation.

The life-history of *P. cruciferae*, which develops entirely underground, is typical of all the species discussed except *P. nemorum*. Oviposition takes place near the surface of the soil, often in cracks, around the food-plant, and continues throughout the life of the generation. The larvae feed on the roots without doing great damage. The mass appearance of adults occurs at any time between the end of July and the end of August. In the laboratory the life-cycle occupied over 7 weeks. *P. nigripes*, which is more common in gardens, oviposits as early as mid-April; later on, its presence is masked by the mass presence of other flea-beetles. Its life-cycle occupied 9–10 weeks in the laboratory. *P. consobrina*, found in the open in winter, also oviposits early; beetles of the new generation emerged in the field during the fourth week of August. *P. undulata* completed its life-cycle in about 6 weeks. *P. vittula* attacked barley and winter-sown wheat in April, but soon left the plants.

The life-history of *P. nemorum* differs in many points from the foregoing species. Eggs are laid in the soil, rarely on the leaves, singly or in threes and fours and not in batches as with the other species. Newly hatched larvae bore up the stem and into the mesophyll tissue of the leaf and may become as destructive as the adults in bad infestations, but only locally and over small areas. When full-fed, the larva enters the ground and pupates in an earthen cell just below the surface. The complete life-cycle occupies 5 or 6 weeks in the field; in the laboratory, however, the incubation period was 19 to 21 days, and the total larval, prepupal and pupal period lasted 33 to 39 days. Maximum emergence of this species and of *P. undulata* occurs during July.

Newton (H. C. F.). **Experiments on the Control of Flea-beetles of the Genus** *Phyllotreta* **injurious to cultivated Crucifer Crops.**—*J. S.-E. Agric. Coll. Wye*, no. 25, pp. 116–140, 38 refs. Wye, Kent, 1928.

From the preceding paper it will be seen that the attack of *Phyllotreta* on cruciferous crops is at its lowest before early May and roughly between the first week of July and that of August, the period between the death of the old generation and the mass appearance of the new. Little damage is done by the latter because of the ability of its food-plant to support it.

Kale sown early enough to be past the cotyledon stage before the beginning of the hot spell, which for three years was observed in Kent to take place about the latter half of May, was untouched by the beetles ; whereas that sown at a later date was badly damaged and had to be resown.

The use of deterrents is indicated, at least in the earlier stages of the plants, the damage then done being too rapid for poisons to be effective, and the agility of the beetle rendering contact insecticides of doubtful value. A spray of 0·15 to 0·2 per cent. nicotine sulphate and 4 to 5 lb. of free soft-soap per 100 gals. applied at the rate of 30 to 40 gals. an acre, proved an effective deterrent. The cost of each application, two being usually the minimum, was estimated, in 1926, at 7*s*. 6*d*. an acre. A dust of 2·5 per cent. nicotine sulphate, with a kaolin base, at the rate of 30 to 40 lb. an acre is effective only when applied in the presence of dew, the cost being approximately the same. The spray, which when used on a small scale prevented an underground attack, is, however, slightly preferred. Spraying with lime-sulphur gave inconclusive results. Of several other substances tested turpentine emulsion at 0·5 per cent. and extract of elder flowers both showed some little promise. Lead arsenate (10–12 lb. to 100 gals.) applied, in the later stages of the plant, to both sides of the leaves in the laboratory had a deterrent action. Another laboratory experiment with sodium fluosilicate dust, 1 part to 9 of hydrated lime, was very successful, as its action was deterrent as well as poisonous. Dusting with lime, soot, ashes, etc., only gives mechanical protection to the plants. Rolling when the latter are in the cotyledon stage and wet with dew would produce to some extent the effect of dusting, owing to the adherence of particles of soil.

Nicotine sulphate, especially a 0·5 per cent. solution, was the only spray, with the exception of pure nicotine, found to have any effective insecticidal action. Finely ground naphthalene, mixed with Fuller's earth at the rate of 1 : 20 and 1 : 10, killed those insects that could not escape from the dust. All beetles that were placed on a layer of non-poisonous dust thick enough to prevent them from jumping, Fuller's earth or lime being used, died at the end of 24 hours.

Flea-beetle carts, catching the insects on a surface covered with adhesive, some types of which are described [*cf. R.A.E.*, A, xiv, 620], are more effective in the field than chemical methods of control.

For preventing underground attacks, steeping the seed with paraffin and turpentine gave negative results. Experiments in the use of various water soluble extracts, chiefly of vegetable origin, were inconclusive. Rolling to consolidate the soil around the germinating plants would render them less accessible to the beetles.

AUSTIN (M.) & THEOBALD (F. V.). **Pyrethrum Experiments.**—*J. S.-E. Agric. Coll. Wye,* no. 25, pp. 59–67. Wye, Kent, 1928.

Common garden and orchard pests were sprayed with an aqueous extract prepared from the dried, coarsely powdered, heads and flower of pyrethrum grown at Wye, including about 3 ins. of stalk. A mixture of 50 gms. of powder, 20 gms. of white soap and 1,000 cc. of water was allowed to stand for three days, and then filtered. This concentrate was well shaken with 9 times its volume of water and thoroughly applied, at the ordinary strength, with a hand syringe.

Most of the Aphids were satisfactorily controlled by the spray, which seems an excellent substitute for nicotine against *Phorodon humuli,* Schr. (hop aphis); *Eriosoma lanigerum,* Hsmn. (woolly aphis) was least affected. Larvae of the winter moth [*Cheimatobia brumata,* L.], *Abraxas grossulariata,* Steph., *Pteronus* (*Nematus*) *ribesii,* Scop. (gooseberry sawfly), and *Pieris* (*Pontia*) *brassicae,* L., were not killed, whereas all those of *Hyponomeuta* died. Half strength sprayings against the latter gave discouraging results. Double strength thoroughly controlled *Macrosiphum rosae,* L. (rose Aphid), half strength being a comparative failure.

In some cases a second spray 24 hours after the first gave complete control. Windy periods during or after spraying had an adverse effect. An alcoholic extract is more effective than an aqueous one. It destroyed all but 7 out of 162 red spiders (*Tetranychus telarius,* L.), 28·42 being the average percentage killed by the aqueous extract.

FRYER (J. C. F.), TATTERSFIELD (F.) & GIMINGHAM (C. T.). **English-grown Pyrethrum as an Insecticide. I.**—*Ann. Appl. Biol.,* xv, no. 3, pp. 423–445, 7 tables, 12 refs. Cambridge, August 1928.

A brief summary is given of a preliminary report on the experimental cultivation of pyrethrum, *Chrysanthemum cinerariaefolium,* in England from seed of both Swiss and Japanese origin [*R.A.E.,* A, xv, 63].

Batches of *Aphis rumicis,* L. (black bean aphis) and of certain caterpillars were sprayed with various concentrations of pyrethrum from Swiss seed, that from Japanese seed being also used in the case of *A. rumicis.* The extracts were prepared by soaking the coarsely ground flowers in a known volume of alcohol for several days, shaking repeatedly, and allowing to settle; the clear supernatant liquid was then diluted with a 0·5 per cent. solution of saponin in water. Each batch of caterpillars after being sprayed was transferred to separate small cages containing fresh food-plants and kept under observation for 8–10 days. *A. rumicis,* which was examined up to the third day after spraying, and the caterpillars of *Notolophus* (*Orgyia*) *antiquus,* L., were all killed by concentrations down to 0·25 per cent. (gm. per 100 cc. in terms of part of plant), but only down to 0·5 per cent. by those from the Japanese variety (tested on *A. rumicis* only). *Selenia tetralunaria,* Hufn., was less easily killed. Larvae of *Pieris brassicae,* L., which were half-grown, proved somewhat more resistant, but at concentrations of 2 and 1 per cent. all died. These latter strengths killed only two or three out of ten larvae of *Barathra* (*Mamestra*) *brassicae,* L., which proved highly resistant, even in a very young stage.

Pyrethrum flowers grown in six different localities from Swiss and Japanese seeds showed only slight differences in toxicity, being similar in this respect to a sample grown in France. The toxicities of extracts of equal weights of flowers grown from Swiss seed and tested at different stages of development differed very little, even when the flowers were artificially dried or not dried at all. The latter were about ten times as toxic as the stalks, weight for weight. Pyrethrum that was exposed for a prolonged period to wet conditions lost some toxicity, but when reasonably stored, it remained for a long time without deterioration. Experiments showed that petroleum ether extracted nearly all the poison from the flowers; an extract made with it was completely toxic down to a concentration of 0·01 per cent. when used soon after extraction.

The chemistry of this insecticide is discussed.

PETHERBRIDGE (F. R.) & THORPE (W. H.). **The Common Green Capsid Bug** (*Lygus pabulinus*).—*Ann. Appl. Biol.*, xv, no. 3, pp. 446–472, 2 pls., 8 figs., 18 refs. Cambridge, August 1928.

Lygus pabulinus, L., has become a serious pest of many cultivated plants in England and also occurs on various weeds. A list of these is given as well as a description of all the stages of the insect, the nymphal instars of which are compared with those of *Plesiocoris rugicollis*, Fall.

Females of the second generation usually lay their eggs singly in the bark, preferably the lenticels, of the current year's shoots of fruit trees and roses (often of the two-year-old stems of currants) from September to early October. During the egg-laying period, which in autumn lasts about 6 weeks, adults do not appear to feed much on the leaves and shoots of currants and gooseberries, being then always more abundant on neighbouring herbaceous plants; in some nurseries they feed readily on apples, plums, cherry stocks and roses. Hatching begins in early April and continues for over a fortnight. Before the end of June five nymphal instars are completed, adults being found from early June to early August. The nymphs, which fall readily from the plants and bushes, tend to migrate, particularly in the later stages, to neighbouring herbaceous plants, strawberries being preferred; in clean plantations a larger percentage of bugs remains on currants and gooseberries. A secondary migration from strawberry to other herbaceous plants occurs in late May and early June; in one case potatoes were badly attacked. Adults fly readily from plant to plant particularly in sunny weather, differing from *P. rugicollis* in this respect. They oviposit in the upper part of herbaceous plants from the second half of June to the end of July, the first nymph being seen on 13th July in 1926. All the nymphs, which feed almost entirely on herbaceous plants, become adult during August. These adults return to fruit trees mainly for egg-laying, blackberry being sometimes used largely as a food-plant.

The saliva of this bug, which feeds on the youngest and most succulent parts of the plant, is very toxic and is the main source of injury, the chief damage to fruit trees and bushes being caused by the young stages of the first generation and by adults of the second. On currants, minute dusky brown spots, which later become holes with irregular brownish edges, appear on the young leaves, red currants suffering more severely than black. Gooseberry leaves are similarly affected. Nymphs hatched on apple shoots appear rather later than those of *P. rugicollis* but cause similar injury, such as brown spots on the leaves and scars on the shoots; further damage is done by adults of the second generation, the wounds on the shoots being covered with an orange-red stain. Young plum trees, as well as pears, may also be attacked. Damage to young strawberry leaves is similar to that on currant, and may also be caused in some cases by *Calocoris norvegicus*, Gmel. (*bipunctatus*, F.). Blackberry leaves may be badly spotted, and, in places the nymphs appear to live on this plant without migrating.

This Capsid is readily killed by a contact wash, its maximum effect being obtained when it is applied after all the nymphs have hatched, *i.e.*, the time when the Bramley Seedling apple is in full bloom. When spraying is delayed, weeds should be kept down to prevent migration. The best method is first to shake the bushes and then spray the ground beneath with 8 oz. nicotine and 8–10 lb. soft soap to 100 gals of water, casein-soda being substituted for soap with very hard water. When weeds are prevalent, it may prove profitable to leave these until oviposition by the first generation is completed and then fork them in. In nurseries when this pest is more likely to be troublesome, a trap crop such as potato may be used to attract the ovipositing females, the tops being cut and destroyed when the young nymphs begin to hatch. Apple trees and the ground round them should be sprayed immediately after blossoming.

CUNLIFFE (N.). **Studies on *Oscinella frit*, Linn. Observations on Infestation and Yield, Susceptibility to Infestation, Recovery Power, the Influence of Variety on the Rate of Growth of the Primary Shoot of the Oat and the Reaction to Manurial Treatment.**—*Ann. Appl. Biol.*, xv, no. 3, pp. 473–487, 3 refs. Cambridge, August 1928.

This paper contains short statements of experimental data and conclusions concerning some aspects of the problem of production of varieties of oats resistant to the attack of *Oscinella frit*, L. The following is taken from the author's summary :—

The quality of a variety may compensate for comparatively heavy infestation. Results of previous experiments on the susceptibility of the oat shoot to infestation [*R.A.E.*, A, xiv, 20] are confirmed, its limitation to the early leaf stages being emphasised. Different varieties of oats react very differently to injury ; the importance of the primary shoot in relation to yield is indicated, this inference being supported by field data relating to panicle production. Differences in rates of growth of the primary shoots of common English varieties were practically negligible, so that observed differences in extents of infestation of these shoots cannot be attributed to this cause. Correlation between extent of infestation of shoot and of grain cannot be expected, because the time of tillering, though not departing much from the mean, was not correlated with that of shoot production. Excess of nitrogenous manure reduced the amount of infestation of the grain, that of the shoot being uninfluenced, during a season when the intensity of the attack of the fly was below normal.

LAING (F.). **Description of a new White-fly Pest of Rhododendrons.**—*Ent. Mo. Mag.*, lxiv, no. 773, pp. 228–230, 6 figs. London, October 1928.

Dialeurodes chittendeni, sp.n., is described from Berkshire on rhododendrons. The pupa cases were massed on the lower surfaces of the leaves and had caused a considerable amount of mottling, while the honey-dew excreted had drenched the upper surfaces of the leaves and provided a matrix for the growth of various sooty moulds, consisting mainly of *Dematium pullulans*.

MILES (H. W.). **The Bay Psyllid,** *Trioza alacris* **Flor.**—*North-Western Naturalist*, iii, no. 1, pp. 8–14, 3 pls., 17 refs. Arbroath, March 1928.

The Psyllid, *Trioza alacris*, Flor, which is widely distributed in Belgium, was recorded in 1926 for the first time in Britain on the leaves of bay (*Laurus nobilis*) in Hertfordshire. The adults hibernate and may be found in curled leaves and débris among the plants taken indoors for the winter. In the spring they become active and feed on the lower surface of the young leaves, causing them to curl up. The first brood appears early in May, and from then until September all stages are present. After this only nymphs and adults occur, and, under normal conditions, most of the former have become adult by mid-October. In Belgium there are three broods a year. The measures usually adopted there are fumigation of the bays in winter storehouses by burning tobacco waste, 2 lb. to 3,000 cu. ft., or with calcium cyanide, ½ oz.–1 oz. per 1,000 cu. ft., and pruning off and burning infested shoots during the growing season. Tent fumigation of large trees, or removing infested shoots and spraying periodically with nicotine-soap or oil emulsion, should keep such trees free from infestation.

A list, with references, is given of other species of *Trioza* of economic importance in various parts of the world.

JACKSON (D. J.). **The Biology of** *Dinocampus* (*Perilitus*) *rutilus*, **Nees, a Braconid Parasite of** *Sitona lineata*, **L. Part I.**—*Proc. Zool. Soc. Lond.*, 1928, pt. 2, pp. 597–630, 4 pls., 67 refs. London, July 1928.

The literature concerning the parasitic activities of the genera *Dinocampus* and *Perilitus* is reviewed. Observations on *D. rutilus*, Nees, were begun in 1919 and continued for several years, with particular reference to the post-embryonic development of this Braconid. This part of the paper is devoted mainly to the adult insect, the egg, and the curious development of the cells of the embryonic membrane. These cells or globules are always present in the body-cavity of the parasitised weevil, *Sitona lineata*, L., and have frequently been mistaken for the disorganised fat-body of the host. They increase in size, absorbing fatty matter from the body fluid of the host, and constitute the principal food of the larva in its later stages.

A short outline is given of the life-history of the parasite, and its habits, including oviposition, are described in detail. Oviposition is usually effected in the apical region of the abdomen of this weevil, though the parasite has also been bred from *S. hispidula*, F. It is common throughout the British Isles and is widely distributed in Europe. The larva on emerging from the egg lies free in the body cavity of the host ; usually only one larva attains maturity in each, though the adults are apparently unable to discriminate between parasitised and unparasitised individuals when ovipositing. When full-grown, the larva emerges from the host and forms a compact silken cocoon covered with particles of soil. The weevil dies soon afterwards; the reproductive organs of the females are rendered functionless as a result of parasitism, which, however, does not have the same effect on the males. There are 2–3 generations of the Braconid in the year; during the summer the development from egg to fully grown larva occupies a month, but in autumn and winter it may take as long as eight months. The time spent in the cocoon varies from three weeks to over a month.

MacDougall (R. S.). **Insect and other Invertebrate Pests in 1927.**—*Trans. Highl. Agric. Soc. Scotland*, (5) xl, pp. 116–145, 16 figs. Edinburgh, 1928.

Notes are given on the bionomics of *Hylemyia* (*Leptohylemyia*) *coarctata*, Fall., with brief descriptions of the various stages [*R.A.E.*, A, ix, 321; x, 366; xi, 566; xvi, 298]. Since for many reasons wheat is the most suitable crop to follow potatoes on land where these two crops are grown, the method of control suggested is to keep such land covered during July and August, the period when the females are seeking bare land on which to lay their eggs. This may be done by sowing a catch crop, such as turnips, rape, etc., between potatoes and wheat. If there is not time for a catch crop, either a winter catch crop may be sown followed by spring wheat, or winter oats may be planted instead of wheat. The alternative method is to alter the crop rotation, and various ones are discussed.

Aegeria tipuliformis, Clerck (currant clearwing) attacks all three varieties of currant, though black currant is preferred. The moths occur in June and July and lay their eggs on the currant shoot. The larvae bore into the stem and tunnel into the pith where they hibernate, pupating in the following April or May.

Theobald (F. V.). **Some recent Advances in the Control of Insect Pests.**—*J. Roy. Hortic. Soc.*, liii, pt. 2, pp. 201–219, 31 refs. London, July 1928.

This paper constitutes a useful summary, chiefly taken from the literature, of recent progress in insect control, dealing with the destruction of insect eggs on fruit trees by winter spraying; *Eriophyes ribis*, Nal. (big bud) in black currants; the apple blossom weevil [*Anthonomus pomorum*, L.]; poison bait for Tipulids and cutworms; and the control of wireworms, woodlice in greenhouses and red spiders.

Adkin (R.). *Hyponomeuta padellus*, **L.,** *H. malinellus*, **Zell., and** *H. cognatellus*, **Hb.**—*Proc. Ent. Soc. Lond.*, iii, pt. 1, pp. 13–14. London, 18th August 1928.

A collection of larvae of *Hyponomeuta* was made with the object of ascertaining whether *H. malinellus*, Zell., occurs in England, and if it is specifically distinct from *H. padellus*, L. The feeding habits of the two species differ considerably. *H. padellus*, which was found on blackthorn and hawthorn, spins a mass of web over several twigs, and as the food-supply is consumed increases this to take in other twigs, while the full-fed larvae spin flimsy dark grey cocoons, which are placed irregularly in clusters within the web. *H. malinellus*, which was taken from crab-apple and cultivated apple trees, is neater in its habits; the webs are spun about a single leaf, the lower cuticle of which is devoured, and then continued up the twig to take in another leaf, or pair of leaves. The full-fed larvae spin dense white cocoons, which are practically always attached to one of the leaves in the web. From differences found in the genitalia of these two moths and of *H. cognatellus*, Hb., and from their feeding habits, the author concludes that all three species, though very closely allied, are distinct. There appears to be little doubt that it is *H. malinellus* that generally attacks cultivated apple trees in England.

MASSEE (A. M.) & STEER (W.). **Capsid Bugs.**—*Gdnrs.' Chron.*, lxxxiv, no. 2174, p. 154, 2 figs. London, 25th August 1928.

Large numbers of the Capsid, *Calocoris norvegicus*, Gmel. (*bipunctatus*, F.) and one female of *Orthotylus* sp., were observed ovipositing in posts made of chestnut wood. As many as 60–70 eggs an hour were deposited in the wood by a single female. *Lygus spinolae*, Mey., which has been observed damaging hops in Kent, possibly oviposits in the hop poles, since, unless the adults hibernate, or an alternative food-plant exists, there is nothing else in which the insects can hibernate after the bine is cut out and destroyed in October. It is suggested that other Capsids of greater economic importance may also make use of wooden posts for oviposition.

TEMPÈRE (G.). **Régime alimentaire anormal de** *Crioceris lilii* **Scop. (Col. Chrysomelidae).**—*Proc. verb. Soc. linn. Bordeaux*, lxxviii (1926), no. 2, pp. 131–133, 1 ref. Bordeaux, 31st May 1927.

Crioceris lilii, Scop., which usually attacks Liliaceae, is recorded from France as feeding on *Solanum dulcamara*.

FEYTAUD (J.). **Les chenilles du prunier. La chenille fileuse.**—*Rev. Zool. agric.*, xxvii, no. 4, pp. 53–58, 3 figs. Bordeaux, April 1928.

An account is given of *Hyponomeuta padellus*, L., which is rather closely associated with the genus *Prunus* in France, though hawthorn (*Crataegus* spp.) and a few other plants are sometimes attacked. There are a number of parasites of this moth, particularly a minute Chalcid, which is polyembryonic. Egg-masses can be destroyed by severe pruning, but hawthorn and blackthorn (*Prunus spinosa*) require similar treatment, as they also bear eggs. Larvae can be collected from the smaller plum trees when they are still in their first nest, between the leaves of the shoots, or again much later when they are constructing their cocoons. The nests should be burnt immediately, but burning on the trees is not recommended. Of various sprays, nicotine, either alone or with alcohol or in Bordeaux mixture, gave the best results. While other formulae had greater powers of wetting and penetrating the nests, a Bordeaux and nicotine spray, besides possessing distinctly toxic properties, gave surer results, while casein or ox-gall is a good spreader. In view of the scarcity and cost of nicotine, however, experiments were undertaken to find a substitute, and lead arsenate or barium chloride, with neutral copper acetate or molasses proved effective. The best time for treating the trees is when the larvae are leaving their first nest and, in cases of heavy infestation, it may be necessary to repeat the treatment. The types of sprayer that have hooked ends, facilitate tearing the nest so that the liquids will penetrate better.

LACROIX (J. L.). **Quelques observations sur une mouche à scie nuisible aux saules,** *Pteronidea salicis*, **L. (Hyménoptère-Tenthredinide).**—*Rev. Zool. agric.*, xxvii, no. 4, pp. 59–66. Bordeaux, April 1928.

Willows in Charente-Inférieure and Deux-Sèvres are sometimes severely attacked by the sawfly, *Pteronus* (*Pteronidea*) *salicis*, L.; in 1924 the usual infestation was prolonged by the appearance of a third generation, probably exceptional, so that the trees could not recover and put out a fresh growth of leaves. The sawfly oviposits on the leaves, generally the young ones at the end of the branches. The incubation period is not known, but the larvae feed for from 20 to 26 days. Four days after the fourth and last moult, the larva burrows into the ground for pupation, which takes place in a double cocoon. During the summer about 25 to 30 days are required for the pupal stage, and if conditions are not favourable for penetrating the ground, the cocoon may be constructed in some cavity in the tree. The author found two parasites of the larvae in the course of numerous rearings, *viz.*, the Ichneumonid, *Mesoleius opticus*, Grav., and the Tachinid, *Ptychomyia selecta*, Meig. The eggs were parasitised by an undetermined fly.

F[EYTAUD] (J.). **La chloropicrine contre la fausse teigne des ruches.**—*Rev. Zool. agric.*, xxvii, no. 4, p. 67. Bordeaux, April 1928.

If hives are infested with *Galleria mellonella*, the infested combs should be placed in a hermetically sealed box into the top of which chloropicrin is introduced at the rate of about 1 oz. to 50 cu. ft. by means of a tube, which is immediately closed, the liquid being poured on to a plate covered with blotting-paper. Excellent results were obtained after 24 hours' exposure.

DESMOULINS (A.) & RANGER (M.). **Un ennemi occasionel du cardon.**—*Prog. agric. vitic.*, xc, no. 33, pp. 158–160. Montpellier, 12th August 1928.

In the valley of the Drôme, *Pyrameis* (*Vanessa*) *cardui*, L., entirely destroyed a crop of cardoons grown for seed in less than 15 days. The infestation began about 10th June, and in a very short time nothing was left of any of the plants except the flower stalks. Nicotine solution, which was not applied until the larvae were well-grown, proved ineffectual.

RÉGNIER (R.). **Les taupins nuisibles en grande culture. Contribution à l'étude de l'***Agriotes obscurus*, **L.**—*Rev. Path. vég. Ent. agric.*, xv, no. 2, pp. 40–47, 2 pls., 1 fig., 3 refs. Paris, February 1928.

The author summarises the work of other investigators on the biology and control of the Elaterid, *Agriotes obscurus*, L., the larvae of which he found to be parasitised by the Proctotrupid, *Phaenoserphus pallipes*, Latr., in the neighbourhood of Rouen at the end of April. These parasites, a description of which is quoted, were bred in the laboratory and emerged in series over a period of 15 days, beginning in early May.

A brief review of control measures, none of which has yet proved entirely efficacious, includes an experiment in which calcium sulphide 50 per cent. mixed with calcium phosphate was used at the rate of 180 lb. to the acre, which, while it preserved the crop of wheat to a certain extent, failed to give results sufficiently satisfactory to justify the expense. Cultural measures recommended include spring rolling, close sowing of beet in fields subject to infestation, and the use of cyanamide and sylvinite as fertilisers.

Duclos (H.). **Contribution à l'étude des parasites des plantes à Madagascar.**—*Rev. Path. vég. Ent. agric.*, xv, no. 3, pp. 67–73. Paris, March 1928.

Coffee bushes in Madagascar are frequently attacked by the Scolytid, *Xyleborus coffeae*, which attacks the lateral branches and suckers, causing them to turn black and dry after losing their leaves. Thorough pruning results in the removal of infested branches (which are immediately burnt) and also aerates the bush ; by this means infestation is largely checked but not altogether eliminated. *Araecerus* (*Araeocerus*) *fasciculatus* attacks the stored coffee beans, but does not cause great damage. In one district, the Coccid, *Lachnodius greeni*, encircles the stem of the plant an inch or two below the surface of the ground, so that the bush withers away in a few months. Exposing the Coccids to the sun is generally a successful measure. In May 1925, there was a sudden invasion of enormous numbers of migrating Lepidopterous larvae, which have not been identified ; in some cases coffee nurseries were completely destroyed by them.

Various species of rhinoceros beetle [*Oryctes*] attack coconuts of less than 4 or 5 years of age, especially when the bark is still tender or accidentally torn ; the larvae are hand-collected and decayed trunks removed from the plantation. Beetles of the genus *Melitomma* have completely destroyed certain plantations ; their presence is easily recognisable by the sawdust below infested trees. The only remedy is the removal of the infested parts, scraping of the wound and painting with tar. The locust, *Locusta migratoria* ph. *migratorioides*, appeared on the east coast in May in 1925 and after passing through the forest zone attacked the rice fields very severely.

Boulangé (H.). **Comment s'enterrent les larves de** *Neurotoma flaviventris*, **Retz. (Hyménopt.).**—*Ann. Soc. ent. Fr.*, xcvi, no. 3–4, pp. 233–239, 2 refs. Paris, December 1927.

This paper gives an account of observations, made in 1914 and 1921 and resumed in 1926, of the larvae of *Neurotoma flaviventris*, Retz., taken from *Crataegus monogyna* and bred in the laboratory, relating particularly to the period at which they cease to feed upon the leaves and leave the silken web that had hitherto sheltered them to bury themselves in the ground.

[Vukasović] Voukassovitch (P.). **Sur l'accouplement des hyménoptères parasites.**—*Ann. Soc. ent. Fr.*, xcvi, no. 3–4, pp. 263–269, 5 refs. Paris, December 1927.

This paper deals with observations on the mating habits of the Ichneumonids, *Angitia armillata*, Grav., and *A. cerophaga*, Grav.; the Braconid, *Macrocentrus abdominalis*, F.; and the Proctotrupid, *Diapria conica*, F.

Kellogg (C. R.). **Diseases of the Silkworm.**—*China J. Sci.*, viii, no. 5, pp. 263–274, 2 pls. Shanghai, May 1928.

The diseases of silkworms [*Bombyx mori*, L.] and the measures to be taken against them are reviewed. Those dealt with are pebrine (caused by *Nosema bombycis*), flacherie (caused by *Micrococcus bombycis*), muscardine (caused by the fungus, *Botrytis bassiana*), and grasserie.

The best known Tachinid parasite of silk worms is *Sturmia* (*Ujimyia*) *sericariae*, Rond., which does serious damage in Japan. The eggs are laid on mulberry leaves and hatch on reaching the alimentary canal of the silkworm. When more than one parasite gains entry, the larva dies before spinning, but if only one parasite attacks it, it usually completes its cocoon. The parasite makes its way out of its host, and pupates in the ground, where it remains until the following spring. In Bengal and Assam the silkworm is attacked by this species and by *Tricholyga bombycis*, Bech. The latter has 8 or 9 generations a year, and one fly may lay as many as 200 eggs. It oviposits on the skin of the silkworm, which may develop as far as spinning a cocoon, if infested by only one parasitic larva.

Takahashi (R.). **Coccidae of Formosa.**—*Philipp. J. Sci.*, xxxvi, no. 3, pp. 327–347, 1 pl. Manila, July 1928.

This is the first report on the Coccidae of Formosa of which 24 species are known to occur on *Citrus* and 6 on sugar-cane. Among those that have not previously been recorded from the island are: *Drosicha contrahens*, Wlk., on avocado (*Persea gratissima*); *Pseudococcus brevipes*, Ckll., on pineapple (*Ananas sativus*); *Trionymus diminutus*, Leon., and *T. sacchari*, Ckll., on sugar-cane; *Phenacoccus hirsutus*, Green, on mulberry (*Morus alba*) and *Hibiscus* sp.; *Coccus mangiferae*, Green, on *Psychotria elliptica*; *Saissetia formicarii*, Green, on *Cinnamomum* spp., oriental persimmon (*Diospyros kaki*), mango (*Mangifera indica*), olive (*Olea europea*), avocado, etc.; *Eucalymnatus tessellatus*, Sign., on *Cinnamomum* sp., etc.; and *Pseudococcus lilacinus*, Ckll., on various food-plants.

Among those described as new are: *Pseudococcus saccharicola*, *Mizococcus* (gen. n.) *sacchari*, and *Lecanopsis sacchari* on sugar-cane.

Takahashi (R.). **Coccidae of Formosa (2).**—*Trans. Nat. Hist. Soc. Formosa*, xviii, no. 97, pp. 253–261, 2 pls. Taihoku, Formosa, August 1928.

Formicococcus cinnamomi, gen. et sp. n., from *Cinnamomum camphora* and *Pilococcus miscanthi*, gen. et sp. n., on *Miscanthus* are described. *Coccus acutissimus*, Green, on *Artocarpus integrifolia*, *Asterolecanium* *pustulans*, Ckll., on *Nerium odorum*, and *Laccifer greeni*, Chamb., on *Ficus wightiana* and mango (*Mangifera indica*), are recorded as new to Formosa.

Matsuda (M.). **Studies on** *Zygina subrufa*, **Melich.** [*In Japanese.*]—*Bull. Dept. Agric. Res. Inst. Formosa*, no. 62, pp. 1–36. Taihoku, Formosa, 1928.

The Jassid, *Erythroneura* (*Zygina*) *subrufa*, Motsch., is widely distributed in Formosa, where it attacks rice, sugar-cane and various wild graminaceous plants. It occurs all the year round, but is most abundant in October. The eggs are usually laid on the midribs of rice leaves, and the nymphs reach the adult stage in 18 days in August. The males are almost equal in number to the females and live 2–35 days, while the females live 2–99 days.

Noguchi (T.). **Report of the Studies on** *Prontaspis yanonensis*, **Kuw.** [*In Japanese.*]—*Spec. Rep. Agric. Expt. Sta. Shizuoka*, no. 2, pp. 1–58. Shizuoka, 1928.

Prontaspis yanonensis, Kuw., is a pest of *Citrus* in the Shizuoka Prefecture, having been introduced from Nagasaki in 1917. It occurs chiefly on the lower surface of the leaves; and the males seem to outnumber the females. The egg stage lasts only about 30 minutes, and there are usually 3, but sometimes 2 generations a year, mostly wintering in the adult stage. A few larvae were found on a Coccinellid, and it is thought that migration may take place by this means. Spraying with oil emulsion killed more than 95 per cent. of the larvae and 90 per cent. of the adults.

[Leefmans (S.).] **Instituut voor Plantenziekten. Zoölogisch Laboratorium.** [Institute for Plant Diseases. Zoological Laboratory.]—*Jaarb. Dep. Landb. Ned.-Indië 1927*, pp. 47–54. Weltevreden, 1928.

In 1927 infestation of the Tettigoniids, *Sexava* spp., attacking coconut in the Talaud islands, by imported parasites had risen to 12·9 per cent. [*cf. R.A.E.*, A, xvi, 130]. Observations at Ragoenan show that *Idiocerus niveosparsus* cannot maintain itself on mango if the ant *Plagiolepis longipes* is kept away. Regulation of the date of planting rice has proved successful against *Scirpophaga innotata*, Wlk. [A, xiii, 467]. Experiments showed that in the hills at an altitude of about 4,000 ft., and at low temperatures, carbon bisulphide at the rate of 75 cc. per cubic metre is ineffective against *Calandra oryzae* in stored maize.

Attempts have failed to introduce *Novius cardinalis* from Japan and Javanese Coccinellids such as *Rhodolia* against the scale, *Ceroputo spinosus*, infesting coffee, but some success attended the introduction of *Cryptolaemus montrouzieri*, previously brought from Hawaii to Java. *Coccophagus* sp. and other parasites are being taken from Java to the Saleier islands to combat the coconut pest, *Aleurodicus destructor*, which is also very harmful in the island of Sangihe, where the Javanese parasites, *Comperiella unifasciata* and *Aphelinus chrysomphali*, have been introduced. Parasites already present in Sangihe are *Casca parvipennis* ? and small numbers of *A. chrysomphali*, possibly belonging to a biological race less effective than the Javanese one.

Hazelhoff (E. H.). *Encarsia*-**onderzoek in aanplant 1927-28.** [Investigations on *Encarsia* in Sugar-cane Fields in 1927–28.]—*Arch. Java-Suikerind.*, 1927, pp. 1109–1112; reprinted as *Korte Meded. Proefst. Java-Suikerind. Pasoeroean,* no. 97, 4 pp. Soerabaia, 1927.

From continued observations in Java [*cf. R.A.E.*, A, xv, 518], it is concluded that centres of infestation of sugar-cane by the white woolly aphis [*Oregma lanigera,* Zehnt.], in which parasitism by the native Chalcid, *Encarsia* [*flavoscutellum,* Zehnt.] exceeds 30 per cent., do not need artificial measures. In large infestations where the Chalcid is absent, such measures must be applied, the parasite being distributed afterwards; but in very small infestations (extending to only a few cane leaves) distribution of the parasite alone is sufficient. In large infestations where the parasitism is under 20 per cent. chemical or mechanical treatment should be employed, a small portion of the field being left untreated so as to preserve the Chalcid.

Corbett (G. H.). **Division of Entomology. Annual Report for 1927.**—*Malayan Agric. J.*, xvi, no. 4, pp. 136–140. Kuala Lumpur, April 1928.

Pests not mentioned in the previous report [*R.A.E.*, A, xv, 656] include *Artona catoxantha,* Hmps., and *Amathusia phidippus,* L., on coconut, the latter being apparently recorded for the first time as causing extensive damage in Malaya. Three parasites of *Tirathaba rufivena,* Walk., have been identified including the Tachinid, *Hemimaticera casifulva,* Bezzi. Pests of rice included the case-worm, *Nymphula depunctalis,* Guen., and the Delphacid, *Sogata pallescens,* Dist., which was, however, confined to crops growing in stagnant water. Liming to increase the alkalinity of the water is suggested, where the irrigation system does not admit of changing it. *Plesispa reichei,* Chap., was abundant on *Nipa* palms, while *P. nipa,* Maulik, was comparatively rare. Another Hispid, *Wallacea palmarum,* Gestro, frequently caused the death of *Areca* palms, feeding between the base of the leaf sheath and the bud. *Citrus* was attacked by *Papilio polytes,* L., *Phyllocnistis citrella,* Staint., and *Prays citri,* Mill., the latter chiefly infesting lemons and causing galls by boring into the rind of the fruit. *Coccus viridis,* Green, is the most prevalent pest of coffee in Malaya, where spraying with kerosene emulsion has been found an effective control, and the Sphingid, *Cephonodes hylas,* L., has been reported on a few occasions. Insects on miscellaneous crops included *Sylepta balteata,* F., on guttapercha [*Palaquium gutta*], *Pyrausta salentialis,* Snell., on maize cobs, *Rhytidodera simulans,* White, in the trunks of mango, and *Miresa bracteata,* Butl., on *Aleurites.*

Bindra (S. S.). **Studies of** *Platyedra gossypiella,* **Saunders (pink bollworm) in the Punjab. Pt. 1.**—*Mem. Dept. Agric. India,* Ent. Ser., x, no. 6, pp. 167–216, 4 pls., numerous refs. Calcutta, February 1928.

Examinations of cotton bolls during 1923 and 1924 show that while *Platyedra gossypiella,* Saund. (pink bollworm) is a serious pest in the south-east of the Punjab, the intensity of attack is successively less in the east, centre and north area, and is least in the west. Climatic conditions, which have probably prevented the bollworm from attaining the status of a pest in the west of the Punjab hitherto, are changing rapidly in the irrigated tracts.

The attack of the bollworm in the south-east amounts at the beginning of August to 10 per cent. on bolls, 8·4 per cent. on loculi, and 4·4 per cent. on seeds, increasing at the end of September to 15·2, 9·7 and 5·1 per cent. respectively and reaching its maximum (63, 42 and 18) by the end of December. As, however, the number of green bolls on the plants is much reduced in November and December, the maximum of damage occurs in October.

The attack of spotted bollworms, *Earias insulana*, Boisd., and *E. fabia*, Stoll., which are less important than *P. gossypiella* in the south-eastern Punjab, varies between 1·4 per cent. and 3·9 per cent., the main period of activity being in the first half of September, just before cotton picking begins. These bollworms are capable of causing greater damage than *P. gossypiella* on account of their larger size. The proportion of bolls attacked jointly by both bollworms was only 2 per cent. The attack of both bollworms independently on green bolls reaches 30 per cent. towards the end of August, 50 per cent. towards the beginning of October, and 70 per cent. in the beginning of December.

Studies carried out in 1924 and 1925 showed that most of the hibernating larvae of *P. gossypiella* pass the winter in seeds, a few being found in lint, either free or in fine silken cocoons. About 5 per cent. of the latter reached the adult stage under laboratory conditions. The adults from these larvae showed two definite emergence periods, the first in May when the cotton is still germinating, and the second in July and August when the crop is bearing bolls, buds and flowers, so that the larvae find ample food. The majority of hibernating larvae are found in 2-seeded chambers, a few in 3-seeded chambers and least of all in 4- and 5-seeded chambers. About 17 per cent. of these larvae reached the adult stage in the laboratory, emerging from April till November, the main emergence period being in July and August. Emergence from either hibernating or short-cycle broods continues throughout the year except between 17th January and 25th March. Larvae present in green bolls before 7th October belong to the short-cycle brood and after 20th November to the hibernating generation, while those present from 7th October to 20th November belong to both. The period of hibernation was found to vary from 12 to 20 weeks.

The actual financial loss to the cotton crop caused by the attack of bollworms is estimated at over £660,000.

Bodenheimer (F. S.). **Contributions towards the Knowledge of the Citrus Insects in Palestine. I. Preliminary Report on the Work of the Palestine Breeding Laboratory at Petah-Tikwa, 1924-27.**—*Palestine Citograph*, i, nos. 5 & 6, reprint 16 pp., 2 figs. Tel-Aviv, June–July 1928.

A study of the biological control of insects attacking *Citrus*, particularly *Pseudococcus citri*, Risso, and *Ceratitis capitata*, Wied., has been carried on for three years. In Palestine there are more than 8 generations of *P. citri* a year ; development ceases entirely when the temperature falls below 8·4° C. [47° F.] and is very much prolonged during the winter. The mortality of the mealybug is lowest in the spring and autumn, somewhat higher in the winter, and highest when the temperature is more than 26° C. [78·8° F.] During the rainy season, numbers of the mealybugs migrate to the ground, depositing their eggs on the roots of various plants. The average number of eggs in one batch is below 200. In Palestine a fall of citrus fruits, when they are about the size of a walnut, occurs at the end of May and the beginning of June. This is partly the result of undefined disturbances in the water economy of the plants, but is also due to the sucking of larvae of *P. citri* between the stalk and the base of the fruit.

An attempt has been made to introduce *Cryptolaemus montrouzieri*, Muls., into Palestine from Egypt, but the mild humid winter has been found to be unfavourable to its development, and no practical success has been obtained. Mortality is also very high when the temperature rises higher than 25° C. [77° F.]. Experimentally, *C. montrouzieri* has 6 generations a year in Palestine, hibernation taking place in the adult stage.

A Hemerobiid, *Sympherobius amicus*, Nav., which has previously only been known from Eritrea, has, however, been found to give satisfactory control. It has 8 generations a year, and lays an average of about 250 eggs. Hibernation takes place chiefly in the larval and pupal stages. Oviposition ceases in December, recommencing at the beginning of March ; the adult stage lasts from 12 to 39 days in the case of females and from 10 to 101 days in the case of males. The feeding capacity of larvae depends on the duration of development ; adult males destroy an average of one mealybug a day, and the females consume from 50 to 300 during their life. In the autumn of 1927, 4,500 *Sympherobius* were distributed in 6 localities, which were heavily infested with *P. citri* ; in none of the groves did dropping of fruit caused by the mealybug continue for more than 10 days after its distribution.

An unidentified species of *Cecidomyia* also manifests high efficiency as a parasite of *P. citri*, though it is difficult to breed artificially. The adult is described. The eggs are deposited separately among those of *P. citri* and develop quickly, the larval stage lasting only 3 to 5 days in summer and autumn. The larvae destroy almost all the available eggs of the mealybug. There are 16 to 17 generations a year, but development ceases when the temperature falls below 12° C. [53·6° F.], mortality being heavy in the winter, when it is difficult to carry out breedings. In the laboratory the adult stage lasted from 1 to 4 days. Very good results were obtained where the midges were liberated in heavily infested orange groves.

Other natural enemies of *P. citri* in Palestine are *Chilocorus bipustulatus*, L., which is, however, of little importance, the Encyrtid, *Tanaomastix* (*Leptomastidea*) *abnormis*, Gir., which was obtained in considerable numbers in the summer, but appears sensitive to climatic conditions, an unidentified fly and *Leucopis* sp.

Attempts to introduce *Opius humilis*, Silv., for the control of *Ceratitis capitata*, Wied., have not met with any success, none of the parasites received having emerged ; bait-sprays are likely to be effective, but further experiments under local conditions are required.

GURNEY (W. B.) & MCCARTHY (T). **Wood Boring Beetles. Their Habits and Control.**—*Agric. Gaz. N.S.W.*, xxxix, pt. 7, pp. 531–537, 3 figs. Sydney, July 1928.

This is a popular account of the wood-boring beetles, *Lyctus brunneus*, Steph., and *Anobium punctatum*, DeG. (*domesticum*, L.), which are the principal species infesting seasoned timber in New South Wales. The bulk of the information has been previously noticed [*R.A.E.*, A, xiii, 228; xvi, 103, 183]. Reference is made to the unnecessary anxiety aroused owing to confusion between the damage due to these beetles and that done by Scolytids and Platypodids. The damage done by *L. brunneus* is invariably confined to the sapwood, while the powdery excretion is packed tightly into the tunnels and is finer than that produced by *A. punctatum*.

TEMPERLEY (M. E.). **The Leaf-eating Ladybird.**—*Queensland Agric. J.*, xxx, pt. 1, pp. 11–16, 1 pl., 3 refs. Brisbane, 1st July 1928.

In Australia *Epilachna vigintioctopunctata*, F., commonly attacks potatoes, tomatos and pumpkins, while cucumbers, cotton and rock-melons are also infested. *Solanum nigrum* and *Datura stramonium* are the two most common weeds on which it feeds, though it is also found on many other solanaceous and cucurbitaceous plants. The geographical distribution of the beetle is given. In other countries egg-plant [*Solanum melongena*] and tobacco are recorded as food-plants.

Both larvae and adults feed on the leaves, the larvae showing a marked preference for the lower surface. The feeding of a few of the Coccinellids merely retards the growth of the plant, but in cases of severe infestation defoliation may occur, the plants may die, and even the denuded stems may be completely destroyed. All stages of the insect are described. Oviposition takes place during the day, the eggs being laid in clusters of 13–45 and hatching in 4 days. The larval stage lasts 17–23 days, the prepupal stage two days and the pupal stage four. The adults only fly short distances. Two females in the laboratory began to oviposit about 16–18 days after emergence, one laying 125 eggs and the other 252, but the number of eggs laid under natural conditions is probably greater.

The ant, *Pheidole megacephala*, F., apparently destroys large numbers of the eggs. Two individuals of *Stomatoceras colliscutellum*, Gir., were bred from pupae. Lead arsenate (1½ lb. to 50 gals. water) is the most satisfactory poison. In severe infestations the crops should be ploughed under to destroy the eggs, larvae and pupae. Weeds should be destroyed even when no crops are planted.

TRYON (H.). **Pineapple Disease Investigations. Interim Report.**—*Queensland Agric. J.*, xxx, pt. 1, pp. 26–34. Brisbane, 1st July 1928.

A large species of *Lepidiota* is injurious in pineapple plantations in the southern part of Queensland, especially on the higher ground and in the heavier soils. The larvae destroy the entire root system, single grubs moving through the soil from one plant to another. They pass at least two years in the soil, and since they may move downward as the surface soil dries, they may be overlooked and the same individual grubs may destroy successive plantings. The adult beetles do not apparently feed on the foliage of trees or plants, but pass the day beneath the soil and emerge at or just after sunset during September and October. The adults may, however, be collected by hand when they emerge, since they settle temporarily on any small bushes that may be stuck in the soil. The larger larvae may be destroyed by fumigating the soil with paradichlorobenzene. The larvae of a similar beetle also attack pineapple roots, but do not gnaw them off short.

Two species of *Pseudococcus* have been found on pineapple plants. One attacks the root system especially, preventing the absorption of nourishment by the root ends and thus proving particularly harmful in dry weather when no new root-formation is taking place. The other feeds principally on the apical growths above ground, either on the developing pineapple or on the tender leaf shoot, but may also attack the older fruit. This species is especially harmful in the northern areas of the State, where it is associated with an ant that protects it from its natural enemies with a canopy of débris. All plants showing the slightest sign of infestation by these mealybugs should be fumigated before distribution.

Quarantine Proclamation, no. 180.—*Commonw. Australia Gaz.*, no. 60, reprint 1 p. Melbourne, 14th June 1928.

Quarantine Proclamation no. 114 is repealed so far as it prohibits the importation into Australia of insects or parasites of insects for experimental purposes, or for use in combating pests and diseases. Such importations are permitted subject to the approval of the Minister for Health.

TAYLOR (T. H. C.). **Progress Report of the Coccinellidae imported from Trinidad to control** *Aspidiotus destructor*.—*Council Paper Legis. Council Fiji*, no. 23, 3 pp. [Suva], 1st June 1928; also *Agric. J. Dept. Agric. Fiji*, i, no. 1, pp. 7–10. Suva, 1928.

Of the Coccinellids imported into Fiji in March 1928, which included *Cryptognatha nodiceps*, Mshl., *Azya trinitatis*, Mshl., *Pentilinea insidiosa*, Muls., and two unidentified species, only the first bred satisfactorily, the others suffering severely from attack by ants. Tube breeding, which saved the other species from extinction, proved unnecessary in the case of *C. nodiceps*, two colonies of which have been already liberated, while there is a prospect of liberating three more shortly. This species alone is considered capable of effecting the maximum degree of natural control of the scale, though further efforts will be made to breed the others.

CRAWFORD (D. L.). **X-Rays on Termites.**—*Proc. Hawaii. Ent. Soc.*, vii, no. 1, p. 36. Honolulu, June 1928.

Termites (*Calotermes immigrans*, Snyder) subjected for from 5 to 30 minutes to various strengths of X-ray (the maximum strength being 30 kilovolts) appeared to be quite unaffected.

ILLINGWORTH (J. F.). **Biological Notes on Scolopendrellidae, destructive to the Roots of Pineapple in Hawaii.**—*Proc. Hawaii. Ent. Soc.*, vii, no. 1, pp. 37–41, 2 figs., 3 refs. Honolulu, June 1928.

During studies of the root system of pineapple plants in cages, observations were made on the activities of Scolopendrellids that were always present in the soil. The female burrows deeply into the soil where the supply of moisture is more or less constant, forms a small cavity, and lays about 8 eggs. These are carefully guarded. The young hatch in about 5 days, and the mother remains until they scatter into the soil about three days later. Notes on the appearance of the early stages are given.

These Symphylids are widely distributed in the pineapple-growing districts of Hawaii, where the paper mulch used provides ideal conditions for rapid multiplication. They eat the growing tips of the roots, rendering them susceptible to attack by various disease organisms. In nature they thrive under logs, stones etc., where they are not subjected to sudden changes of moisture and temperature.

The larvae and adults of the Staphylinid, *Philonthus discoideus*, Grav., and of the Cucujid, *Cryptamorpha desjardinsi*, Guér., prey on the Symphylids.

PEMBERTON (C. E.). **Thysanuran predatory on Eggs and immature Forms of Termites in Borneo.**—*Proc. Hawaii. Ent. Soc.*, vii, no. 1, p. 147. Honolulu, June 1928.

During examinations of the mounds and galleries of termites in logs in British North Borneo, a small Thysanuran, resembling *Lepisma*, was frequently encountered in close association with the termites. It feeds on the eggs and the soft, immature termites, piercing the outer skin and sucking the body fluids. The extreme rapidity of its movements enables it to live amidst active termites without danger of injury by the workers or soldiers, but it did not appear to be sufficiently abundant to be effective in controlling them.

PEMBERTON (C. E.). **Nematodes associated with Termites in Hawaii, Borneo and Celebes.**—*Proc. Hawaii. Ent. Soc.*, vii, no. 1, pp. 148–150, 1 ref. Honolulu, June 1928.

An account is given of the infestation by Nematodes of the head, and, in the case of one species, of the abdomen, of termites in Celebes, North Borneo and Hawaii.

BUSCK (A.), U.S. Bur. Ent. *Phthorimaea lycopersicella*, **new Species (Family Gelechiidae), a Leaf Feeder on Tomato (Lep.).**—*Proc. Hawaii. Ent. Soc.*, vii, no. 1, pp. 171–174, 2 pls., 2 refs. Honolulu, June 1928.

Phthorimaea lycopersicella, sp. n., is described from tomato. This moth was previously confused with *P. glochinella*, Zell., which is occasionally injurious to egg-plant in the eastern part of the United States. A study of the genitalia shows that these species are distinct, *P. glochinella* at present being confined to the east and south of the United States, while *P. lycopersicella* occurs in California, extending into the west coast of Mexico and has recently been accidentally introduced into the Hawaiian Islands, where it appears to be well established.

SWEZEY (O. H.). **Notes on the Tomato Leafminer,** *Phthorimaea lycopersicella,* **Busck, in Hawaii (Lep.).**—*Proc. Hawaii. Ent. Soc.*, vii, no. 1, pp. 177–178. Honolulu, June 1928.

The larva of *Phthorimaea lycopersicella*, Busck, has been taken from the leaves of both wild and cultivated tomatos in several of the Hawaiian Islands. It behaves rather differently from related leaf-miners. It folds over the edge of the leaf, fastens together the surfaces of a fold or wrinkle, or makes use of a lobe of a new leaf that has not entirely unfolded, and feeds on the inner protected surface. A mine is sometimes made extending from the shelter, but the larva does not remain in it when it is not feeding. Several hiding places may be used consecutively, pupation occurring in one of them. Tomato is apparently the only plant attacked, and as the fruit is not injured, this pest is not so important in Hawaii as *P. operculella*, the larvae of which infest tomato fruits. The larvae are parasitised by *Angitia blackburni*, Cam., which spins its cocoon inside that of its host. A brief description of the larva is given.

SWEZEY (O. H.). **Palm Seed Scolytids in Hawaii (Col.).**—*Proc. Hawaii. Ent. Soc.*, vii, no. 1, pp. 185–187, 1 ref. Honolulu, June 1928.

Coccotrypes dactyliperda, F., has been reared in Hawaii from the seeds of the following palms : *Phoenix dactylifera* (date palm), *Livistona* spp., *Oreodoxa regia*, *Washingtonia filifera* and *Pritchardia pacifica* ; and *Coccotrypes* (?) *pygmaeus*, Eich., from those of *P. dactylifera*, *Livistona chinensis*, *Sabal* spp., *Cocothrinax argentea* and *Pritchardia thurstoni*.

BONDAR (G.). **Brocas das anonaceas.** *Alphus canescens*, **Dej.** [Borers of Anonaceae. *A. canescens.*]—*Correio agric.*, vi, no. 5, p. 93, 1 fig. Bahia, May 1928.

In Bahia, Brazil, Anonaceae are frequently attacked by a Lamiid, *Alphus canescens*, Dej., the larvae of which mines the cambium of the trunks and branches, pupating in the wood. Mechanical extraction of the larva is recommended.

BONDAR (G.). **As pragas dos feijões na Bahia.** [Bean Pests in Bahia.] —*Correio agric.*, vi, no. 5, pp. 106–110, 1 fig. Bahia, May 1928.

Chalcodermus angulicollis, F., is one of the most serious pests of pulses in Bahia. The weevils attack the pods and oviposit in the seeds ; the larvae feed in the seeds and pupate in the ground. The complete life-cycle lasts about a month. *Vigna catjang* and *V. sesquipedalis* are severely infested. *Phaseolus vulgaris* is not so readily attacked, but losses of 10 per cent. have been recorded. *P. lunatus* and *Dolichos lablab* are not attacked, while only one larva was found in thirty pods of *Canavalia ensiformis*. Two mites, *Tetranychus gloveri*, Banks, and *Tarsonemus phaseoli*, sp. n., attack the leaves of beans. The former attacks *P. vulgaris* and to a less extent *P. lunatus*, while *Vigna* spp. and *Dolichos* spp. are almost uninfested. The latter was taken on *P. vulgaris* and *P. lunatus*. Both mites can be combated by spraying with a solution of 10 lb. soap or 1½ lb. flowers of sulphur in 30 gals. water.

DA COSTA LIMA (A.). **Nota sobre dois chalcidideos que infestam sementes de** *Canavalia ensiformis*. [Note on two Chalcidoidea infesting Seeds of *C. ensiformis*.]—*Chacaras e Quintaes*, xxxviii, no. 1, pp. 29–32, 5 figs., 2 refs. S. Paulo, 15th July 1928.

A Eurytomid, *Prodecatoma spermophaga*, sp. n., is said to be the chief pest of *Canavalia ensiformis* in the Brazilian state of Bahia. In many pods all the seeds are destroyed before they can develop. The author had previously observed in Brazil the Encyrtid, *Trichencyrtus robustus*, Ashm., infesting the pods of *C. ensiformis*. Apparently the only other Encyrtids recorded from plants in Argentina are two gall-forming species, *Minapis nigra*, Brèthes, from *Scutia buccifolia*, and *Eutetracera ringueleti*, Brèthes, from *Calliandra bicolor*.

BONDAR (G.). **Uma broca polyphaga,** *Sphallenum setosum*, **Germ.** [A polyphagous Borer, *S. setosum*.]—*Chacaras e Quintaes*, xxxviii, no. 1, pp. 33–34, 2 figs. S. Paulo, 15th July 1928.

The Cerambycid, *Sphallenum setosum*, Germ., has been observed to attack guava in the state of Bahia, but only those trees are affected that support a wild, climbing leguminous plant, *Canavalia* sp. The eggs are laid between the spirals of this plant and the trunk around which they are wound. As the soft stem of *Canavalia* affords little protection against birds, the larvae bore into the trunk, the injury being aggravated by the pecking of the birds. If the climbing plant dies before the year of larval development is complete, the larva continues to develop normally in the guava tree. *S. setosum* has been noticed also in *Anona* entwined by *Phaseolus lunatus* (lima bean), and it occurs also in *P. lunatus* and *Dolichos* sp. growing unsupported.

BONDAR (G.). **A lagarta da batata no Brasil.** [The Potato Caterpillar in Brazil.]—*Correio agric.*, v, no. 12, pp. 281–284. Bahia, December 1927.

Phthorimaea operculella, Zell., occurs throughout S. Paulo and Bahia and probably in other States of Brazil, being usually found on tobacco and other Solanaceae, but being much less harmful to potato than it is in northern countries. Differences in colour and size are due to the food-plants [*R.A.E.*, A, ii, 280]. There is therefore no reason for maintaining the present Brazilian legislation under which many imported shipments of potatoes are destroyed at the ports.

GAUDRON (J.). **Requisitos para la importación de semillas y plantas. Explicacion de la ley No. 1221 de Policia sanitaria vegetal.** [Requirements for the Importation of Seeds and Plants. An Explanation of the Peruvian Plant Protection Law No. 1221.]—*Circ. Estac. exper. agric. Soc. nac. agrar.*, no. 6, 11 pp. Lima, January 1928.

Notes explaining the law of 1909 restricting the importation of seeds and plants are given, together with the texts of the laws and numerous decrees, etc., deriving from it.

Rodriguez Adame (J.). **Un raro procedimento para combatir la "hormiga arriera."** [An unusual Method of combating Leaf-cutting Ants.]—*Bol. mens. Defensa agríc., Sec. Agric. Fom. México*, ii, no. 4–5, pp. 122–123. S. Jacinto, D.F., 1928.

In the State of Jalisco, Mexico, leaf-cutting ants [*Atta*] are a serious pest of young maize. To protect it, wild plants known to be attractive to this ant are placed on the nests, and it is suggested that these baits might be sprayed with lead arsenate.

Informa de las actividades de la Oficina federal para la Defensa agrícola, durante los meses de enero, febrero, marzo y abril de 1928.—*Bol. mens. Defensa agríc., Sec. Agric. Fom. México*, ii, no. 4–5, pp. 127–248. S. Jacinto, D.F., 1928.

This report includes a list of the pests reported in the various States of Mexico from January to April 1928. Two species of leaf-cutting ants, *Atta cephalotes*, L., and *A. fervens*, Say, occur in Mexico, the former being easier to combat, as its nests are not so deep in the ground. A fruit-fly found in Yucatan, but not observed to attack orange, was found to be distinct from *Anastrepha ludens*, which occurs in other parts of Mexico. Oranges in Sonora are severely infested by *Chrysomphalus ficus* (*aonidum*) and *C. aurantii*. Petroleum emulsions killed up to 85 per cent. of the scales in some cases, but spotted the fruits. Maguey [*Agave*] is attacked by a Lamiid, *Acanthoderes funerarius*, and coconut by the weevil, *Rhynchophorus palmarum*, the larva of which can be killed by introducing a plug steeped in carbon bisulphide into the mine, which is then sealed. The numerous pests of tobacco included the Noctuids, *Feltia annexa* and *F. malefida*. Cucurbits were attacked by *Diabrotica fairmairei*, *D. balteata* and *Aphis gossypii*. The larvae of *Epicaerus cognatus* are serious pests of potato. Crop rotation and the use of pigs to clear all tubers from the ground are recommended. Fumigation with carbon bisulphide, at the rate of 25 gms. per cubic metre space, killed the larvae in 12 hours.

Snyder (T. E.). **Insect Damage to Yellow and White Pine Timbers in the Roof of the White House.**—*J. Wash. Acad. Sci.*, xviii, no. 13, pp. 381–382. Baltimore, Md., 19th July 1928.

Pine timbers from the roof of the White House, Washington, D.C., were found in 1927 to be infested by *Hexarthrum ulkei*, Horn. The ends of heavy beams were badly weakened and even broken off, and laths attached to the beams were also attacked. The weevils usually lay their eggs in crevices in timber in dark and poorly ventilated places. Impregnation of the wood with zinc chloride would prevent infestation, and even coats of varnish would probably be effective. The insects can be killed by thoroughly saturating the wood with orthodichlorobenzene, applying the liquid with a mop, or as a spray. Several applications may be necessary.

Snapp (O. I.). **Insects attacking the Peach in the South and how to control them.**—*Fmrs'. Bull. U.S. Dept. Agric.*, no. 1557, 42 pp., 26 figs. Washington, D.C., May 1928.

About 90 per cent. of the damage done to peaches by insects in the southern United States is due to three species. *Conotrachelus nenuphar*, Hbst. (plum curculio) is the most serious pest of all, and in 1920 it was estimated to have damaged the peach crop in Georgia to the extent of over £400,000. There are generally two generations in a season. Spraying or dusting with lead arsenate is a sufficient protection against normal infestation, and a schedule suitable for use in Georgia is given. Supplementary measures are the collection and destruction of dropped peaches, disking under the spread of the trees from mid-May until the end of June, and jarring the trees. *Aegeria exitiosa*, Say (peach borer) which either directly or indirectly causes the death of many peach trees in the Southern States, is generally dealt with by extracting the larvae. Mounds of soil should be heaped round the bases of the trees in early July, thus forcing the small larvae to enter the tree higher up than normally. In November or December the mounds are removed and the soil taken from the base of the tree to a depth of 6 or 8 inches; the borers are removed with a hawk-bill knife, and the soil is replaced. Treatment with paradichlorobenzene is also described [*R.A.E.*, A, xvi, 454]. Against *Aspidiotus perniciosus*, Comst. (San José scale) the use of lubricating oil emulsions and of lime-sulphur solution is discussed.

The life-histories and habits of these pests are described in some detail; minor peach pests that are dealt with more briefly are *Cydia* (*Laspeyresia*) *molesta*, Busck, *Scolytus rugulosus*, Ratz., *Aegeria pictipes*, G. & R., *Anarsia lineatella*, Zell., *Heliothis obsoleta*, F., *Lecanium nigrofasciatum*, Perg., *Aulacaspis pentagona*, Targ., *Nezara viridula*, L., *Diabrotica duodecimpunctata*, F., *Pomphopoea aenea*, Say, *Cotinis nitida*, L., *Aphis setariae*, Thos., and several species of plant bugs and grasshoppers. Notes are also given on suitable insecticides and on spraying and dusting equipment.

[SEVERIN (H. C.).] **Entomology-Zoology.**—*Ann. Rep. S. Dakota Agric. Expt. Sta. 1926–27*, pp. 15–19. Brookings, S.D. [n.d.].

Further observations on the bionomics of *Aegeria* (*Synanthedon*) *pictipes*, G. & R. (plum tree borer) in S. Dakota are recorded [*cf.* *R.A.E.*, A, xv, 600]. The larvae feed freely on the tender growing bark of plum trees at the margins of wounds and other injured tissue. Such areas attract the ovipositing females.

Wire screen, burlap, etc., placed about the trunks and larger limbs of the trees, give little protection from this moth. One part of paradichlorobenzene was found to be soluble in four parts of liquid paraffin. When this mixture, which is kept liquid by being heated with water in a double boiler, is applied to the affected parts of the trees with a paint brush, it hardens into an elastic coating from which the paradichlorobenzene slowly vaporises. The fumes penetrate the tree tissues and kill those larvae that are exposed to them for more than 12 days.

Entomology.—*40th Ann. Rep. Texas Agric. Expt. Sta. 1927*, pp. 36–41. College Station, Tex., 1928.

Preliminary notes are given on various entomological projects, the full results of which will be subsequently published. It has been found that 70 per cent. of the cotton boll weevil [*Anthonomus grandis*, Boh.] are killed as a result of collecting the particles of calcium arsenate dust from the surface of the leaves and stems and that only 30 per cent. obtain it from feeding on squares and bolls. During 1927, the cotton hopper [*Psallus seriatus*, Reut.] largely emerged before the cotton was planted and infestation was slight, so that the various measures applied showed very little difference in the yield of cotton ; a superfine dusting sulphur, which kills the immature stages, has been found to give the best results, applications when dew was present giving only slightly better control than those made under dry conditions. An evening primrose (*Gaura brachycarpa*) is recorded as an additional food-plant of *P. seriatus*.

Anastrepha ludens, Lw. (Mexican fruit-fly) was found to be comparatively widespread in the Lower Rio Grande Valley [*cf. R.A.E.*, A, xv, 543].

REINHARD (H. J.) & OWEN, jr. (W. L.). **Investigations on Control of Cotton Flea Hopper in 1927.**—*Bull. Texas Agric. Expt. Sta.*, no. 380, 27 pp., 1 graph. College Station, Tex., May 1928.

Heavy local infestations of *Psallus seriatus*, Reut. (cotton fleahopper) that occurred late in the season of 1927, were satisfactorily controlled on half acre plots of cotton by applications of sublimed flowers of sulphur at weekly intervals. Tests with 19 different insecticides in the control of *P. seriatus* on *Croton* indicate that various forms of sulphur are effective when applied at the rate of 15–20 lb. to the acre at weekly intervals. The average daily control secured over a 14-day period ranged from 79·6 to 86·7 per cent. Two mixtures of sulphur and tobacco dust, 70 : 30 and 80 : 20, resulted in an average daily control of 71·1 and 74·2 per cent. respectively. While nymphs yield rapidly to sulphur treatment, succumbing in some cases in less than an hour, the adults are apparently unaffected under field conditions. Five new food-plants were encountered during the course of these investigations, and the complete destruction of all weed growth several days before planting cotton is recommended in view of the large number of spring weeds on which *P. seriatus* is known to feed.

GREGORY (C. T.) & DAVIS (J. J.). **Common Garden Pests. What they are and how to control them.**—8vo, 150 pp., figs. Des Moines, Iowa, Better Homes & Gardens, 1928.

This is a compilation of the available information on the diseases and insects attacking flowers, trees, shrubs and vegetables. In the first chapter the nature of plant pests is discussed and various types of spray outfits are illustrated. In three subsequent chapters the common garden flowers, ornamental trees and shrubs, and vegetables are arranged in alphabetical order with notes on the pests and diseases of each and measures for their control. A short chapter is devoted to the pests and diseases of lawns, and an appendix contains a discussion of the preparation and use of various insecticides and fungicides.

SMITH (M. R.). *Plastophora crawfordi* **Coq. and** *Plastophora spatulata* **Malloch (Diptera : Phoridae), parasitic on** *Solenopsis geminata* **Fabr.**—*Proc. Ent. Soc. Wash.*, xxx, no. 6, pp. 105–108, 5 refs. Washington, D.C., 18th July 1928.

The author observed the Phorids, *Plastophora crawfordi*, Coq., and *P. spatulata*, Mall., striking and presumably ovipositing in workers of the fire ant, *Solenopsis geminata*, F., in Mississippi. The ants were attacked when actively running over and around the nest, in one case at the time of the nuptial flight ; the attack of the fly apparently paralysed the ant for several seconds. The development of the larva of another Phorid, *Apocephalus pergandei*, Coq., in the head of the worker of *Camponotus herculeanus pennsylvanicus*, DeG., in the United States was described by Pergande in 1900.

HARTZELL (F. Z.) & GAMBRELL (F. L.). **Lubricating Oil Emulsions for the Control of Pear Psylla. The Dormant Oil Spray and the Pear Spray Schedule.**—*Circ. N. Y. Agric. Expt. Sta.*, nos. 98 & 102, 4 & 4 pp. Geneva, N.Y., March & April 1928.

The use of oil sprays for the control of the pear psylla [*Psylla pyricola*, Först.] has already been noticed [*R.A.E.*, A, xvi, 460]. Circular no. 98 includes a specification of the best type of oil for such sprays, as well as formulae for their preparation. In the second circular a spray schedule for use against *P. pyricola* and other insects is included. When a late dormant application of oil has been made, it would probably be advisable to avoid lime-sulphur in the cluster-bud treatment for scab, as the small amount of oil remaining on the green tissues might cause the sulphur to injure the leaves of the fruit buds. Bordeaux mixture is suggested instead of lime-sulphur spray or sulphur dust.

The calyx spray of lead arsenate and Bordeaux mixture is important for the control of codling moth [*Cydia pomonella*, L.] and pear scab. Should the Psyllid become abundant during the summer, an emergency spray of Bordeaux mixture with 1 U.S. pt. nicotine sulphate is recommended. If treatment has been omitted until August, a spray of 10 lb. lime and 1 U.S. pt. nicotine sulphate in 100 U.S. gals. water should be substituted owing to the danger of spray residue on the fruit. If for any reason it is feared that the pears will retain lime at picking time, 3 lb. of soap may be used in place of the lime.

CECIL (R.). **The Mexican Bean Beetle.**—*Circ. N. Y. Agric. Expt. Sta.*, no. 96, 12 pp., 8 figs. Geneva, N.Y., February 1928.

The Mexican bean beetle [*Epilachna corrupta*, Muls.], which spread to New York in 1927 [*R.A.E.*, A, xvi, 398], is likely to become permanently established as a serious pest of beans, as it is able to withstand the very low temperatures prevailing during the hibernation period, while no effective parasites appear to exist there. A brief description of this Coccinellid is given, with some account of its distribution and bionomics. Control measures recommended include the application of sprays consisting of 1½ lb. calcium arsenate and 3 lb. hydrated lime or 2 lb. magnesium arsenate to 100 U.S. gals. water ; or dusts consisting of 1 part calcium arsenate to either 7 parts hydrated lime or 1 part sulphur and 4 parts hydrated lime, at the rate of 12–15 lb. to the acre. Directions are given for the application of both sprays and dusts, the former being more effective. Treatments should begin as soon as the eggs become numerous and be repeated at intervals of 7–14 days according to the degree of infestation, amount of rain and rate of growth of the plants.

King (K. M.) & Atkinson (N. J.). **The Biological Control Factors of the immature Stages of** *Euxoa ochrogaster*, **Gn. (Lepidoptera, Phalaenidae) in Saskatchewan.**—*Ann. Ent. Soc. Amer.*, xxi, no. 2, pp. 167–188, 1 graph, 14 refs. Columbus, Ohio, June 1928.

This is a study of the natural factors tending to control the red-backed cutworm, *Euxoa ochrogaster*, Gn., with particular reference to a recent outbreak in Saskatchewan [*R.A.E.*, A, xiv, 430]. Fifteen parasites have been reared, and their relative importance is discussed. The chief are *Meteorus vulgaris*, Cress., with which *M. dimidiatus*, Cress., is possibly identical, and *Gonia* spp. (especially *G. aldrichi*, Toth., and *G. fusicollis*, Toth.) the biology of which are dealt with [xii, 50]. The percentage of parasitism by the former has fluctuated in close relation with the prevalence of *E. tristicula*, Morr., which is the principal host of the alternate generation; when *E. ochrogaster* became plentiful, parasitism of it reached 30 per cent. Although the habits of *Gonia* spp. are largely correlated with those of the cutworm host, parasitism by these Tachinids has not been heavy during the years under observation. The Ichneumonid, *Sagaritis atkinsoni*, Vier., has been reared by the authors from *E. ochrogaster* only, but it probably also parasitises closely related species. The adults emerge during the last weeks of June, and the particular value of this parasite lies in the fact that it destroys the host larva in the fourth instar, before it can do much damage. *Berecyntus bakeri* var. *gamma*, Gir., is polyembryonic and passes the winter within the egg of *E. ochrogaster* or within the hibernating larva of another host, the parasites being invisible until the host has formed its pupal cell. The peak of abundance of this Encyrtid in the field is considerably in advance of that of *E. ochrogaster*, and this renders it less effective.

The total parasitism of the cutworm tends to remain fairly constant, thus increasing the average length of time between outbreaks, but there is no evidence that parasites are likely at any time to control the periodic outbreaks. It is always found that disease has effected control of an outbreak before the parasites have had time to do so, and thus disease is the most important factor in control. The commonest disease, thought to be caused by *Bacillus noctuarum*, closely resembles cutworm septicaemia and assumes epidemic proportions when warm, wet weather occurs combined with abundance of the cutworms.

Painter (R. H.). **Notes on the Injury to Plant Cells by Chinch Bug Feeding.**—*Ann. Ent. Soc. Amer.*, xxi, no. 2, pp. 232–242, 1 pl., 14 refs. Columbus, Ohio, June 1928.

As certain varieties of *Sorghum* are far more easily injured by chinch bugs [*Blissus leucopterus*, Say] than others, a study has been made of the actual injury to individual cells and tissues. This paper deals with the method of puncture by the bug, the plant cells affected, etc. The feeding habits on different varieties of food-plant are briefly touched upon and the feeding habits of nymphs and adults are compared. There is evidence that some dissolving factor, probably the salivary fluid, plays an important part in enabling the chinch bug to puncture the plant cells, and this process is aided by pressure on the stylets. The action of the stylets, of which the objective is usually the phloem, is described. Very little injury to the cells is caused by the piercing of the stylets; it occurs chiefly from the withdrawal of the fluid from the phloem xylem and tubes and the stoppage of these conducting tissues by sheath material, resulting in the starvation of both roots and leaves. The source of food-supply of the bug is almost entirely the phloem tissue. The only difference between the feeding punctures of the nymphs and adults lies in the doubling of the size of the stylets during growth. The presence of tannins may be important in the problem of resistant and susceptible varieties.

SMITH (M. R.). **The Biology of *Tapinoma sessile*, Say, an important House-infesting Ant.**—*Ann. Ent. Soc. Amer.*, xxi, no. 2, pp. 307–329, 1 pl., 1 fig., 15 refs. Columbus, Ohio, June 1928.

The following is taken from the author's summary: *Tapinoma sessile*, Say, a native North American ant, is of considerable importance as a house pest in many localities in the United States. The synonymy and a re-description of the species are given, the immature stages also being described. The ants overwinter out of doors as de-alate females, workers and larvae. Workers begin foraging as early as March and oviposition and uniform development of the brood begins in late April and continues until cold weather. The overwintering larvae attain maturity in April, having spent from 6 to 7 months in this stage. From April to June workers can be produced in from 5 to 9 weeks, while from July to September they require only 6 to 7 weeks to attain maturity. Alate females were observed at various dates from 17th June to early July. Males appeared from 10th June to 9th July, only large, strong colonies apparently being capable of producing sexual forms. Colonies range from 100 to 10,000 individuals, many being de-alated females. Nests have been found in houses, under the bark of logs and stumps, in galls on plants, in stems of plants, under débris and in the soil. The species is apparently eurythermal in disposition, as it is found throughout most of North America from the sands of the seashore to heights of over 10,000 ft. and from boggy situations to perfectly dry inland spots. Workers have been seen foraging at temperatures as low as 50° F. The natural food of the ants is honeydew, supplemented by the flesh of organisms. In houses they feed on fruits, vegetables, meats and sweets, but seem to show a preference for sweets.

GLASGOW (H.). **Insect Pests of Canning Crops in 1927.**—*Circ. N. Y. Agric. Expt. Sta.*, no. 100, 7 pp. Geneva, N.Y., March 1928.

Field experiments were carried out to determine the minimum amount of lead arsenate that could be used in orchards to give commercial control of the cherry fruit-fly [*Rhagoletis* spp.], since the only criticism of this method of control is that excessive amounts of arsenic might possibly occur in the canned cherries. In one case the three usual applications against curculio [*Conotrachelus nenuphar*, Hbst.] and *Rhagoletis* were made, but only half the ordinary amount of arsenic was used. In the other case the usual amount of arsenic was used, but only two applications were made, the first 10 days after the fall of the petals and the second about halfway between dates on which the second and third sprays are usually applied.

In the first case the infestation by both *Rhagoletis* and curculio was reduced to less than 1 per cent. In the second case the infestation by *Rhagoletis* was reduced to 1 per cent., and by the curculio to practically nothing, but adult fruit-flies were fairly common on the trees at harvest time and probably represented the individuals that had emerged late and would ordinarily have been killed by the third spray application. From these and similar tests it is concluded that the safer procedure is to reduce the concentration of the spray rather than the number of applications.

The influence of neglected plantings on the control of fruit-flies was shown by the increase in infestations in a sprayed orchard adjacent to a larger one that had not been treated for several years. It was found that the number of larvae in infested cherries was normally reduced by 50–60 per cent. in the ordinary process of canning, and it was possible by slightly modifying the usual procedure to reduce the number by nearly 90 per cent. Tests to determine the influence of canning operations on the removal of spray residue show that the greatest amount is removed in the washing vats. Water alone appears to be sufficient to remove the bulk of the deposit. The residue is not dissolved but merely softened by the water, after which it is mechanically removed by the rubbing of the cherries against one another. If necessary, the removal could be made even more complete by prolonging the washing process or by installing some mechanical system of agitation in the vats.

A crop of carrots infested with the carrot rust fly [*Psila rosae*, F.] is unfit for canning in any form. Carrots planted after 1st June and harvested in the first half of September usually escape injury. If the crop is to be left in the ground until the carrots are fully grown, the only alternative is to plant it in an area comparatively free from the pest. Screening with cheesecloth proved a successful measure for the control of the spinach leaf-miner [*Pegomyia hyoscyami*, Panz.], but since this pest is not uniformly destructive each year, it is doubtful whether the expense is warranted when spinach is grown primarily for canning. By planting as early as possible in the spring, fertilising thoroughly to induce rapid growth, and harvesting the crop as soon as the insects begin to appear in numbers, the early crop of spinach for canning can often be produced without serious loss.

PEAIRS (L. M.). **Some Phases of the Relation of Temperature to the Development of Insects.**—*Bull. W. Virginia Agric. Expt. Sta.*, no. 208, 62 pp., 19 figs., 31 tables, 9 pp. refs. Morgantown, W. Va., August 1927.

This is a detailed account of experimental work undertaken to investigate many points concerning the effect of temperature on the development of certain insects. The material employed included the larvae and pupae of some Muscoid flies, and of *Leptinotarsa decemlineata*, Say (also eggs), *Heliothis* (*Chloridea*) *obsoleta*, F., and *Pieris* (*Pontia*) *rapae*, L., and the pupae of *Cydia* (*Carpocapsa*) *pomonella*, L., and *Malacosoma americana*, F. The following is taken from the author's summary.

The degree of temperature directly affects the rate of development of certain insects, and a straight line curve for the velocity of development expresses this relation best for most of the range of temperature permitting development, a slowing up of acceleration being indicated at the upper end of the curve and the reverse condition at the lower. This latter is probably due to factors other than temperature, the actual effect of which would be to decrease the rate of acceleration. For all points along the straight part of this velocity curve, a given accumulation of temperature, or thermal increment, expressed in day-degrees, will accomplish a constant effect in growth or development. Furthermore, this temperature may be summed from the zero of the curve, near which point but somewhat below it, as found by other investigators, development ceases. No definite method of locating this latter threshold of development is suggested. Development is accelerated by variations in the daily temperature. It is evident that the quantity of carbon dioxide produced during a developmental period is near a constant, regardless of temperature, any departure from the constant being probably due to basal metabolism not directly associated with developmental processes. The law of van't Hoff and possibly Arrhenius' formula may be applied to developmental data, but the graphic interpretation provides a more convenient method of analysis.

LATHROP (F. H.). **The Biology of Apple Aphids.**—*Ohio J. Sci.*, xxviii, no. 4, pp. 177–204, 4 diagrs., 19 refs. Columbus, Ohio, July 1928.

This paper is the result of a study of Aphids first undertaken in New York in 1915–16 and continued in Ohio in 1916–17, and deals with the three most commonly injurious species, namely, *Anuraphis roseus*, Baker (rosy apple aphis), *Rhopalosiphum prunifoliae*, Fitch (apple-grain aphis) and *Aphis pomi*, DeG. (green apple aphis). The life-histories and habits are described, and a key is given distinguishing the species. The eggs of *R. prunifoliae* are the first to hatch in the spring, generally as the apple buds begin to show green at the tips. This species is primarily a pest of small grains though it may occasionally produce heavy infestation of the blossom clusters. *Anuraphis roseus* hatches somewhat later and is the most serious pest in bearing orchards, attacking the developing fruit clusters and deforming the fruit. *Aphis pomi* is the last to hatch, the buds usually being well developed when the nymphs appear, and, though capable of deforming the fruits, generally confines its attacks to the rapidly growing portions of the tree and is primarily a pest of young plantings.

All these species hibernate in the egg stage on apple, where *A. pomi* spends the entire summer. *R. prunifoliae* passes the summer on various grains and grasses and *Anuraphis roseus* on plantain, and these two species may live on their secondary food-plants throughout the winter in mild climates. Climatic influences produce certain variations in behaviour of these Aphids, and environmental conditions influence to some extent the number of generations produced in a season and the production of winged and of gamogenetic forms. The interrelations of these factors are illustrated diagrammatically. In special studies with *A. pomi*, evaporation was not found to give a satisfactory index to the rate of development, but when no other factor intervenes, temperature is a satisfactory index. The average rate of reproduction of 128 individuals of this species was 3·23 nymphs per adult for the first 16 days of adult life; after this the average rate declined rapidly.

The effect of Aphid attack on apples is an inhibition of growth in direct proportion to the severity of the attack, the inhibition being more pronounced in the transverse diameter of the fruit than in the axial dimension. *Anuraphis roseus* produced the greatest effect on the fruit, *Aphis pomi* was scarcely less injurious, while *R. prunifoliae* had comparatively little effect.

Fulton (B. B.). **Cockroach Destruction in Buildings.**—*Circ. Iowa Agric. Expt. Sta.*, no. 112, 4 pp., 1 fig. Ames, Iowa, May 1928.

This popular account of the biology and control of cockroaches causing damage in buildings deals with the following species : *Blattella germanica*, L., *Blatta orientalis*, L., *Periplaneta americana*, L., *P. australasiae*, F., and *P. fuliginosa*, Serville. Remedial measures include dusting with sodium fluoride and fumigation with calcium cyanide 2½–3 lb. or sulphur 2 lb. to 1,000 cu. ft.

Cory (E. N.) & McConnell (P. A.). **The Phlox Plant Bug.**—*Bull. Maryland Agric. Expt. Sta.*, no. 292, 22 pp., 11 figs. College Park, Md., September 1927.

Lopidea davisi, Knight (phlox plant bug), previously recorded as *L. media*, Say, was first reported in Maryland in 1916 as causing injury to *Phlox paniculata* (perennial phlox) [*R.A.E.*, A, vi, 373] ; it is widely distributed in the eastern and southern States. All stages are described. The eggs are deposited 2 or 3 together in the leaf petioles and stems, and the nymphs and adults feed on the upper surfaces of the leaves, showing a preference for tender foliage and developing buds. White or light green spots appear on the leaves, the plants become stunted, and the blossom heads often lose their symmetry. Other species of *Phlox* are only occasionally attacked. Hibernating eggs hatch early in May and those of the next generation in July. Owing to the extended oviposition period, all stages are found on the plants at the same time. The incubation period varies from 15 to 18 days, and the total life-cycle from egg to adult lasts 46–55 days. Cutting off and burning phlox stalks at the close of the growing season should prevent overwintering, but adults may migrate from adjacent untreated plants. Of various insecticides used, the most satisfactory results were secured with 40 per cent. nicotine sulphate, 1–500, with soap as a spreader, and with liquid toilet soap (30–35 per cent. soap) at the rate of 1 lb. to 4 U.S. gals., both in the form of a forceful mist spray.

Hamner (A. L.). **The Pecan Phylloxera.**—*Quart. Bull. Mississippi Pl. Bd.*, viii, no. 1, pp. 1–4, 2 figs. A. & M. College, Miss., April 1928.

Four species of *Phylloxera* attack pecan in Mississippi [but *cf. R.A.E.*, A, xiv, 64]. In most cases the outbreaks have been restricted to isolated trees or one or two trees in a group, the limited distribution of the Aphids being largely due to their poor means of locomotion. The general life-history is as follows : a small wingless female hatches from an overwintering egg and crawls either to a young leaf or to a twig, according to the species. After it has sucked the plant juices for some little time, a gall forms round it in which it oviposits. The females that hatch from these eggs in a few days, either lay their eggs in the gall or crawl to other leaves and twigs before ovipositing. The eggs of this second generation give rise to both males and females, and after pairing the females crawl to a sheltered place on the limbs of the tress and die without extruding the single egg that develops. An undescribed species of *Phylloxera* attacks only the leaves of the pecan, interfering with their normal functions and no doubt reducing the vitality of the trees. *Phylloxera caryaecaulis*, Fitch, primarily attacks the twigs, but is also frequently found on the leaves. Another species, that has only been recorded a few times from this State, is probably potentially the most serious pest, since it attacks the leaves and petioles and deforms the fruit. Small moth larvae often bore into the galls of *P. caryaecaulis*, and in some years a small Hymenopterous parasite effectively reduces the numbers of the species attacking the leaves. Encouraging results were obtained by thoroughly spraying with a 3 per cent. lubricating oil emulsion or with lime-sulphur, 1 : 8. It may be necessary to spray for two or three years, starting in the winter after the galls are first discovered.

LYLE (C.). **The Pink Bollworm Situation.**—*Quart. Bull. Mississippi Pl. Bd.*, viii, no. 1, pp. 5–7. A. & M. College, Miss., April 1928.

A summary is given of the recent developments of the situation with regard to the pink bollworm [*Platyedra gossypiella*, Saund.] in the United States. The Mississippi quarantine against seed cotton and cotton seed was repealed on account of a decision of the United States Supreme Court, but a new quarantine has been established owing to the recent discovery of a new infestation [*R.A.E.*, A, xvi, 463], and at present no seed cotton or cotton seed may be shipped from Texas into Mississippi.

LANGSTON (J. M.). **Cutworm Investigations following the Overflow.**—*Quart. Bull. Mississippi Pl. Bd.*, viii, no. 1, pp. 7–8. A. & M. College, Miss., April 1928.

Cutworms are usually abundant in Mississippi after the floods [*cf.* *R.A.E.*, A, xv, 630], and observations were therefore carried out to obtain information on the effect of the overflow on them and on their natural enemies. As a result of digging in 50 separate localities, no cutworms or Carabid beetles (their most important natural enemies) were found alive where the land had been under water for a week or more. The conclusion that cutworms cannot survive submergence for more than a week is also indicated by the destruction of heavy infestations by the second rise of the river in June and July, even in one case where the cotton was not killed by the water. No important cutworm moths were collected at lights in or near the flooded area until *Laphygma frugiperda*, S. & A. (southern grassworm) was taken on 8th August, at which time the larvae were common in the area. No eggs of cutworms or grassworms were obtained in collections made from the soil or rank grasses, and the negative results of both these methods render them of doubtful value in predicting cutworm outbreaks following floods. *Agrotis ypsilon*, Rott. (greasy cutworm) was the most abundant species in the flooded areas, causing severe damage to cotton, maize and soy-beans ; *L. frugiperda* was also numerous, injuring maize and soy-beans and occasionally cotton. *Prodenia ornithogalli*, Guen. (cotton-boll cutworm) was frequently collected, but the injury it caused was comparatively negligible. Both Hymenopterous and Tachinid parasites were present, but the rate of parasitism was less than 1½ per cent., as compared with 67·8 per cent. in the unflooded parts of the State. This may have been partly due to the fact that most of the larvae collected were nearly full-grown and may, therefore, have been those that had escaped parasitism, since the most important Hymenopterous parasites attack half-grown larvae. The almost total absence of Dipterous parasites was doubtless due to the floods.

AINSLIE (C. N.), U.S. Bur. Ent. **The Pale Western Cutworm** (*Porosagrotis orthogonia*) (**Lepid.**).—*Canad. Ent.*, lx, no. 7, pp. 157–161. Orillia, Ont., July 1928.

An account is given of the bionomics of *Porosagrotis orthogonia*, Morr. (pale western cutworm) in North Dakota [*cf. R.A.E.*, A, x, 111, etc.]. Rye stubble appears for some reason to be unsuitable for oviposition. Sixty acres of maize were planted half on wheat stubble and half on rye stubble, and where the maize replaced wheat it was almost totally destroyed, while hardly a maize plant was missing on the ground where rye had been, the line of demarcation between the two halves of the field being quite distinct. Burning over infested fields does not appear to be a satisfactory measure of control, though it is clear that clean cultivation does much towards reducing the numbers of cutworms.

HARTMAN (H.), ROBINSON (R. H.) & ZELLER (S. M.). **The Removal of Spray Residue from Apples and Pears.**—*Bull. Oregon Agric. Expt. Sta.*, no. 234, 38 pp., 3 figs. Corvallis, Ore., June 1928.

This is an account of the chemistry of the phases connected with the removal of the spray residue from apples and pears, and of the effect of spray residue removal on the keeping quality of these fruits [*cf. R.A.E.*, A, xvi, 25], and also of the work done on disinfectants in relation to the washing process. Chemical analyses offer the only reliable basis for determining whether fruit sprayed with arsenicals requires cleaning to meet the various tolerances. The use of disinfecting compounds for keeping the washing baths free from contamination is not at present recommended. A simple method for the determination of the strength of the acid in the bath is outlined.

ROARK (R. C.). **Review of United States Patents relating to Insecticides and Fungicides issued during December 1927.**—13 pp. multigraph. [Continued as :]

ROARK (R. C.). **Reviews of United States Patents relating to Pest Control.**—i, nos. 1–6, 13, 11, 15, 15, 16, 21 pp. multigraph. Washington, D.C., U.S. Dept. Agric., Bur. Chemistry & Soils, 1928.

Abstracts of the patents relating to insecticides, etc., issued from the beginning of December 1927 to the end of June 1928 are given [*cf. R.A.E.*, A, xvi, 328].

ENGLISH (L. L.). **Some Properties of Oil Emulsions influencing Insecticidal Efficiency.**—*Bull. Illinois Nat. Hist. Surv.*, xvii, art. 5, pp. 233–259, 8 figs., 26 refs. Urbana, Ill., March 1928.

The following is taken from the author's conclusions : Emulsifying agents used in making oil emulsions for sprays vary in wetting ability, as measured by Stellwaag's angle-of-contact method, and consequently cause variations in the effectiveness of the emulsions. This is especially important in the control of Aphids.

The stability of oil emulsions, which is indicated to some extent by the size of the globules, is one of the principal factors in insecticidal efficiency. The type of oil emulsified, the kind and amount of emulsifying agent, the quality of water used for dilution, and other factors commonly considered unimportant, are capable of causing changes in stability.

Increased effectiveness may or may not be accompanied by an increase in size of globules. Increased size of globules is the result of desirable qualities in an emulsion rather than the cause of effectiveness.

For use against Aphids, the most effective emulsion is one that has high wetting ability coupled with instability. Either of these factors may vary so as to be dominant.

In the control of scale insects, the instability of the emulsion is the primary factor in efficiency. High wetting ability is not necessary for the control of San José scale [*Aspidiotus perniciosus*] and oyster-shell scale [*Lepidosaphes ulmi*], because of the comparative ease with which their food-plants are wetted. The emulsions used against them should release quickly an oil of sufficiently high viscosity and low volatility to give a persistent residue.

A saturated oil, because of its influence in some cases on the stability of the emulsion, may be more effective than an unsaturated oil. The amount of oil adhering and taking proper effect on the insect is dependent upon both the wetting ability and the instability of the emulsion. Inadequate wetting is a common cause of inefficiency, but excessive wetting, which results in some of the emulsion running off from objects that are easily wetted, is also a possible cause. These conditions are dependent on the kind of emulsion and the insect involved.

In order to be innocuous to plant foliage, an emulsion should be as inert chemically as possible. Soaps and unsaturated oils tend to injure foliage. Each oil emulsion should be considered as a particular individual insecticide, having properties peculiar to itself and giving results that other emulsions may not.

RIPLEY [L. B.]. **Top-dressing Maize against Stalk-borer.**—*Fmg. S. Afr.*, reprint no. 10, 5 pp., 9 figs. Pretoria, February 1928.

To test the effect on the yield of maize of injury by chemicals applied against the stalk-borer [*Busseola fusca*, Fuller] [*cf. R.A.E.*, A, xv, 334; xvi, 304], experiments were made with a carbolic sheep dip, a sheep dip containing derris, sodium arsenite, and sodium fluosilicate. Each substance was mixed with water at two different strengths, one intended to scorch severely and the other moderately. Plants were treated with about a tablespoonful (10 cc.) of the liquid when 2 to 3 ft. high. Injury to the maize by the various substances is discussed, and it is concluded that yields are frequently reduced by the use of too strong a solution, the carbolic dip diluted at 1 : 150 being responsible for a loss of more than 30 per cent. of the crop, while sodium arsenite, even at 1 : 1,200, may cause a loss of 40–50 per cent. The plants withstand heavier scorching by sodium fluosilicate than by sodium arsenite or carbolic dips, so that the visible damage may not always correspond directly with the reduction of yield. The dip containing derris was the most successful, combining exceptionally high killing power with relatively low scorching properties and cost, and giving a satisfactory kill diluted at 1 : 250 ; a tablespoonful or less should be poured into every plant on the first signs of infestation. The carbolic dip diluted at 1 : 350 may also be used without injury to the plants.

Entomological Notes, no. 39.—*Fmg. S. Afr.*, July 1928, reprint 2 pp. Pretoria, 1928.

So far natural enemies do not control the cotton bollworms effectively in South Africa. A list is given of the parasites and predators recorded, many of which, however, have not yet been identified ; they include the Braconid, *Apanteles diparopsidis*, Lyle, and the Pentatomid, *Glypsus conspicuus*, Westw., attacking the larvae of *Diparopsis castanea*, Hmps. ; and the Tachinids, *Linnaemyia longirostris*, Macq., *Paratachina ingens*, B.B., *Phorocera blepharida*, B.B., and *Sturmia laxa*, Curr., attacking the larvae of *Heliothis* (*Chloridea*) *obsoleta*, F. Parasitism of *D. castanea* hardly ever exceeds 5–10 per cent., but that of *H. obsoleta* may reach 50 per cent., especially late in the season.

The Mymarid egg-parasite of the eucalyptus snout-beetle [*Gonipterus scutellatus*, Gyll.] has succeeded in overwintering in all parts of the country where it had become established during the summer of 1926–27 [*cf. R.A.E.*, A, xvi, 304]. The first recoveries were made in the early spring on the coast, while on the high veldt no recoveries were made until the end of September. During the summer of 1927–28, the parasites were liberated in plantations throughout the infested areas in the Transvaal, Orange Free State and Natal. The parasite is able to travel considerable distances ; in one instance it was found 100 miles away from the nearest point of liberation during the previous season. It is expected that the parasite will be dormant on the high veldt until late in September. In the south-west of Cape Province it is widely and thoroughly distributed.

Jack (R. W.). **Report of the Chief Entomologist for the Year 1927.**—*Rep. Secy. Dept. Agric. S. Rhodesia 1927*, pp. 25–29. Salisbury, 1928.

Insects attacking economic crops in 1927 are reviewed [*cf. R.A.E.*, A, xv, 638]. Pests of cotton included *Aphis gossypii*. Experiments on the relation of Jassids [*Empoasca facialis*] to premature reddening of cotton foliage indicate that although it is possibly induced by Jassids it is probably a characteristic reaction of a variety rather than a direct result of attack, since at least one variety may be severely attacked without marked reddening of the foliage.

Pests of tobacco included Tenebrionids (*Psammodes*, etc.), *Phthorimaea operculella*, and *P. heliopa*, the attacks of which were probably associated with the sparse rainfall during the growing season, cutworms (chiefly *Euxoa segetum*), the larvae of a Curculionid, which bore into the stems, and certain ants that carry off the germinating seedlings.

Maize was damaged by cutworms, Tenebrionids (*Trachynotus* spp.) and a weevil, *Tanymecus destructor*. For the third year in succession *Heliothis obsoleta* attacked the young fruit of *Citrus* in September. The aerial parts of some potato plants were considerably damaged by *Phthorimaea operculella* (tuber moth).

HARDENBERG (C. B.). **Térmites ou formigas brancas.** [Termites or White Ants.]—*Bol. agric.-pecuário Moçambique*, 1928, no. 1, pp. 28–33. Lorenzo Marques, 1928.

Termites are the most serious and widely distributed pests in Mozambique, the commonest species being *Termes badius*, Hav., and *T. latericius*, Hav. Notes are given on their bionomics and control. The nests may be destroyed by digging them out or blowing them up with gunpowder, or they may be fumigated with carbon bisulphide, calcium cyanide dust or, best of all, by means of a machine burning a mixture of 9 parts flowers of sulphur and 1 part white arsenic and pumping the fumes into the nest. The fumes condense on the walls of the passages and render them permanently uninhabitable after the death of the colony. Preventive measures include painting timber with carbolineum, etc., mixing copper sulphate in the mortar used at points where beams enter walls, and the erection of buildings on pillars. Sacks soaked in sodium arsenate may be used as poison-baits in plantations.

FOURNEAU (L.). **Le sahlbergella du cacaoyer à la Côte d'Ivoire.**—*Rev. Bot. appl. Agric. colon.*, viii, no. 83, pp. 509–510. Paris, July 1928.

Sahlbergella singularis, Hagl., is recorded, apparently for the first time, from the Ivory Coast, where it is widely distributed on cacao. Brief notes are given on its habits and the injury it causes [*R.A.E.*, A, xiv, 570].

NÊME (—). **French Equatorial Africa : Plant Pests observed recently in the Colony of Ubanghi-Shari.**—*Internat. Rev. Agric.*, xix, no. 4, pp. 399–400. Rome, April 1928.

Diparopsis castanea, Hmps., and *Earias insulana*, Boisd., occur on the bolls and shoots of cotton, the latter also attacking *Hibiscus*. *Noctua melicerta*, Drury,* is recorded as often doing considerable damage to the castor-oil plant, *Ricinus communis*. It is very abundant in dry years and in localities with an intense Sudan climate. It is suggested that the plant should be grown as an annual, or at least that the parts above ground be burned after the harvest. *Pseudococcus filamentosus*, Ckll., also occurs on the castor-oil plant, but is rare.

BRUGIROUX (A.). **French Settlements in Oceania : Some Insects damaging Crops.**—*Internat. Rev. Agric.*, xix, no. 4, p. 400. Rome, April 1928.

This is a report from the Agronomic Station of Tahiti at Papeete. On coconut, *Aspidiotus destructor*, Sign., had previously been checked by *Aspidiotiphagus citrinus*, Craw, *Aphelinus chrysomphali*, Mercet, and a species of *Chrysopa*, but it increased extensively in some places in 1927, following an abnormal drought. Attempts to introduce *Novius cardinalis*, Muls., against *Icerya purchasi*, Mask., and *Diachasma tryoni*, Cam., against *Dacus* sp., which causes considerable injury to most fruits, proved unsuccessful.

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* This moth has probably been misidentified, as *Achaea janata*, L., of which *N. melicerta* is a synonym, has not been recorded from Africa.—ED.

Other pests mentioned are *Aspidiotus cyanophylli*, Sign., on bamboos, cucurbits, etc.; *A. rapax*, Comst. (*camelliae*, Sign.), on mangos; *Anisolabis annulipes*, Luc., on cacao; *Chrysomphalus ficus*, Ashm. (*aonidum*, auct.), on coconut; *C. aurantii*, Mask., on lemon; *C. dictyospermi*, Morg., on mango; *Cylas formicarius*, F., on sweet potato; *Cosmopolites sordidus*, Germ., on banana; *Diocalandra taitensis*, Guér., on coconut; *Euscepes batatae*, Waterh., on various yams; *Pinnaspis* (*Hemichionaspis*) *minor*, Mask., on coconut; *Lepidosaphes beckii*, Newm., *Morganella maskelli*, Ckll., and *Parlatoria cinerea*, Doane & Hadden, on Aurantiaceae; *Promecotheca reichei*, Baly, and *Ripersia palmarum*, Ehrh., on coconut; and *Rhabdocnemis obscura*, Boisd., on sugar-cane and banana.

VAYSSIÈRE (P.). **Le criquet pélerin et les données biologiques récentes sur les acridiens migrateurs.**—*C. R. Assoc. franç. Avan. Sci.*, 51st session, pp. 554–558, 10 refs. Paris, 1927.

This is a brief review of the literature on locust periodicity and phases, with particular reference to *Schistocerca gregaria*, Forsk.

Conseil international scientifique agricole (C.I.S.A.). Resolutions adoptées à la première session, 7-12 novembre 1927.—8vo, 102 pp. Rome, Institut International d'Agriculture, 1928.

The Commission for Plant Pests and Diseases adopted resolutions calling attention to the necessity for the official control on similar lines in all countries of the chemical composition of insecticides, etc., and for tests of their efficiency; for a collection of the literature on the subject of plant protection for international use; for the unification of measures concerning the importation of plants; and for an index of all institutions for the protection of plants, of the work they are doing and of the scientific personnel attached to them. The resolutions adopted by the sections dealing with the olive fly (*Dacus oleae*, Gmel.), cotton pests (*Anthonomus grandis*, Boh., and *Platyedra* (*Pectinophora*) *gossypiella*, Saund.) and locusts are also given.

JACKSON (T. P.). **Work connected with Insect and Fungus Pests and their Control.**—*Rep. Agric. Dept. St. Vincent 1927*, pp. 6–9. Trinidad, 1928.

Alabama argillacea, Hb., occurred in negligible numbers on cotton in 1927. On the Island of Mustique slight but protracted attacks occurred; *Polistes annularis*, L., is not found there, and it is possible that other natural enemies are not so common as in St. Vincent. *Platyedra gossypiella*, Saund. (pink bollworm) was first found on 19th November, whereas in the previous year it was found on 25th September. *Dysdercus delauneyi*, Leth. (cotton stainer) was numerous in the northern part of the Island during May. A number of John Bull trees (*Thespesia populnea*) that had attracted stainers were destroyed. In some instances where cotton plants had been cut down instead of being uprooted, *Eriophyes gossypii*, Banks (leaf blister mite) attacked the new growth. The usual minor pests of cotton [*R.A.E.*, A, xv, 51] and other plants [xv, 52] were observed.

Box (H. E.). **Observations upon** *Lixophaga diatraeae,* **Townsend, a Tachinid Parasite of** *Diatraea saccharalis,* **Fabr., in Porto Rico.**—*Bull. Ent. Res.*, xix, no. 1, pp. 1–6, 1 fig., 11 refs. London, August 1928.

Studies of the Tachinid, *Lixophaga diatraeae,* Towns., which is probably larviparous, carried out in Porto Rico from February 1925 until early in 1927, indicate that the larva gains access to its host, *Diatraea saccharalis,* F., through one of the thoracic spiracles. At the completion of the larval period, which does not last more than 6 days, the Tachinid generally leaves the host and pupates in its tunnel, though the puparia are sometimes found within the skin of a dead larva or pupa of the host. The pupal period lasted 8–12½ days. The adults generally emerged during the early hours of daylight, and mating was observed in the field early in the morning. In captivity the flies fed with avidity upon sweetened water or sugar-cane juice, the males dying rapidly and the females living as long as six days. In the rare cases in which more than one parasite larva was found in one host, the resultant flies were small and proved to be males. The majority of the parasitised larvae were half-developed ; where pupae were parasitised, these had apparently been attacked after pupation. No cases of hyperparasitism have been observed in Porto Rico.

The average amount of parasitism by *L. diatraeae* varied from 12 per cent. in February–March 1925, when borers were scarce, to 37 per cent. during October and November 1926, when their occurrence in young canefields is at its maximum. This heavy degree of parasitism may perhaps account for the scarcity of borers in the spring. Although *D. saccharalis* is sometimes attacked in Porto Rico by *Sarcophaga sternodontis*, Towns., *L. diatraeae* is the only larval parasite there of any economic importance. In spite of the possibility of cases of superparasitism resulting from the recent introduction of the Braconid, *Microdus diatraeae,* Turner, into the south of Porto Rico, the total parasitism by the two insects should be greater than by either parasite alone. Though it does not seem possible to increase the efficiency of *L. diatraeae* artificially, some system should be adopted to prevent the destruction of the Tachinids when borer control is practised by the cutting out of dead hearts.

It is recommended that further efforts should be made to import *L. diatraeae* from Cuba into Louisiana, where losses due to *Diatraea* sometimes exceed one-third of the sugar crop ; previous introductions [*cf. R.A.E.*, A, vii, 279] have shown that it can survive the winter there, though it does not appear to have become established. If transport were effected by aeroplane, the proportion of parasites surviving the journey, hitherto 33 per cent., could probably be raised to 100 per cent. It is further suggested that other parasites of *D. saccharalis* in Argentina [xvi, 159] should be introduced into Louisiana. Attempts to introduce *L. diatraeae* into north-west Mexico [xiv, 541] and British Guiana [xiii, 86] proved unsuccessful, but the author believes it to be the most promising enemy of *Diatraea* for establishment in the West Indian islands and the surrounding countries.

CLEARE, jr. (L. D.). **A Method for the Rearing of Egg Parasites of the Sugar-cane Moth Borers.**—*Bull. Ent. Res.*, xix, no. 1, pp. 31–38, 2 pls., 3 figs., 1 ref. London, August 1928.

A detailed account is given of a method and apparatus employed in British Guiana since 1921 for the rearing of the egg parasites of the small moth borers of sugar-cane (*Diatraea* spp.). Diagrams are given showing the construction of the cages used, and the technique of the method is discussed. As many as 75 per cent. of the eggs in a field of mature canes have been found to be parasitised by *Trichogramma minutum*, Riley, the average parasitism of which is estimated to be about 40 per cent. of all eggs. Although during the wet season *Prophanurus alecto*, Cwfd., exerts a decided check on the borers, it is on the whole much less important. It is possible that the method described will be applicable to other species of *Trichogramma* such as *T. nanum*, Zehnt., and *T. australicum*, Gir., both of which are parasitic on *Diatraea* in Java, and the latter in Mauritius.

CHINA (W. E.). **Two new Species of *Cicadulina*, China (Homoptera, Jassidae) from the Gambia, West Africa.**—*Bull. Ent. Res.*, xix, no. 1, pp. 61–63, 2 figs. London, August 1928.

Balclutha mbila, Naudé, is referred to the genus *Cicadulina*, China [*R.A.E.*, A, xiv, 458]. *C. arachidis* and *C. similis*, spp. n., are described from Gambia on ground-nuts. *Cicadulella*, n.n., is proposed for the Jassid genus, *Cicadulina*, Haupt (1927) *nec* China (1926).

CAMERON (M.). **A new Staphylinid Beetle preying on Red Spider in Mauritius.**—*Bull. Ent. Res.*, xix, no. 1, p. 65. London, August 1928.

Oligota (*Holobus*) *pallidicornis*, sp. n., described from Mauritius, was found on cassava preying on red spider mites.

CHRYSTAL (R. N.) & MYERS (J. G.). **Natural Enemies of *Sirex cyaneus*, Fabr., in England and their Life-history.**—*Bull. Ent. Res.*, xix, no. 1, pp. 67–77, 1 pl., 17 refs. London, August 1928.

The following is taken from the authors' summary :—

Studies have been carried out at Oxford of *Rhyssa persuasoria*, L., and *Ibalia leucospoides*, Hochenw., both parasitic on *Sirex cyaneus*, F., with a view to introducing these species into New Zealand against *S. juvencus*, L. (now considered a variety of *S. noctilio*, F.), which is very destructive there to plantations of *Pinus radiata*.

R. persuasoria lays its eggs in the burrows of *S. cyaneus*, near to the almost or quite full-fed host larva or pupa, by piercing the solid wood with its ovipositor. Feeding is entirely ectoparasitic and takes only a few weeks, during which the host larva may burrow a little further. This parasite hibernates as a resting larva and pupates in the spring, the whole life-cycle normally occupying one year.

I. leucospoides oviposits in the young larva just before or, more rarely just after, hatching, utilising the oviposition bores of *Sirex* for this purpose. Larval feeding appears to be entirely endoparasitic. Larvae of *S. cyaneus* parasitised by *I. leucospoides* confine their boring largely to the outer portions of the trunk and usually make their final cell just under and approximately parallel to the surface. The life-cycle of this parasite requires at least two years.

Adults of both *R. persuasoria* and *I. leucospoides* may be easily kept in captivity, the former feeding readily on honey-dew or honey-water and the latter on split raisins. The resting larvae of both may be kept in gelatin capsules packed in sawdust, which is not allowed to become entirely dry. Owing to the very different instars that they attack, there seems no risk of superparasitism.

THEOBALD (F. V.). **Four new British Aphides.**—*Ent. Mo. Mag.*, lxiv, no. 773, pp. 224–228, 5 figs. London, October 1928.

Among the species dealt with is *Anuraphis petherbridgei*, sp. n., on apple in England. The Aphids are found under the leaves and produce a certain amount of leaf curling. They are very conspicuous when alive owing to their shiny black colour, small size and active habits.

VAYSSIÈRE (P.). **Le problème acridien.**—*Matér. Etude Calamités*, v, no. 17, pp. 55–64, 14 refs. Geneva, April-June 1928.

A summary is given of information, chiefly from published reports, on the occurrence and control of locusts in various countries, covering the last months of 1927 and the beginning of 1928.

In Morocco a great invasion of *Schistocerca gregaria*, Forsk., took place in the Sous region during the second half of November 1927; in some places the locusts deposited their eggs on the surface of the ground. In Algeria several swarms arrived from the south, but the distribution of the eggs up to the end of January was not considered extensive.

A summary of results of recent studies on locust bionomics is also given.

PAILLOT (A.). **Sur la biologie d'***Eulimneria crassifemur* **Thoms., parasite de la pyrale du maïs.**—*C.R. Soc. Biol.*, xcix, no. 26, pp. 821–822, 2 refs. Paris, 18th September 1928.

During 1927 the mortality of the eggs and larvae of *Eulimneria crassifemur*, Thoms., infesting *Pyrausta nubilalis*, Hb., in France was estimated at 80 per cent. of the total eggs laid. Thompson and Parker suggest in a paper already noticed [*R.A.E.*, A, xvi, 528] that this mortality is due to a cytolitic enzyme secreted by the first larva that hatches acting on the other eggs and larvae. The author points out that this does not hold good in those cases where all eggs die or where the larvae die in the process of hatching in the absence of a developing larva, and he therefore suggests that *P. nubilalis* is only an accidental host of *E. crassifemur*. The adults of the parasite emerge several months before the larvae of *P. nubilalis*, and it seems unlikely that the females wait so long to deposit their eggs. The existence of intermediate hosts is therefore probable. The larvae of *Clysia*

(*Conchylis*) *ambiguella*, Hb., and *Polychrosis botrana*, Schiff., that hatch at the beginning of May are parasitised by *E. crassifemur*, but the rate of parasitism does not appear to be sufficiently high to play an important part in the maintenance of the parasite.

PUSSARD (R.). **Quelques observations biologiques sur** *Niptus hololeucus*, **Fald.**—*C.R. Soc. Biol.*, xcix, no. 26, pp. 826–827. Paris, 18th September 1928.

During 1927–28 observations were made in France on the bionomics and control of the Ptinid, *Niptus hololeucus*, Fld., which is particularly abundant in houses, shops, warehouses and factories. The adults are present throughout the year, but are most numerous during the oviposition periods, August to September and April to May. They may be very long-lived, adults taken in August 1927 surviving until March 1928. Their food is very varied, and includes animal matter, such as dead individuals of their own species, the empty skins of the pupae of *Polychrosis* (*Eudemis*) [*botrana*, Schiff.], the living pupae of *Bombyx mori*, L., and the eggs of *Cerambyx scopolii*, Füssl., and vegetable matter such as bran, flour, dry cake crumbs, and cherries. They also attack wood previously damaged by other insects, particularly *Anobium* and *Rhyncolus*, but have never been known to injure sound wood [*R.A.E.*, A, xvi, 610]. The damage is most noticeable in textiles, particularly wool and silk goods. They attacked almost immediately various stuffs that had been spotted with oil, saccharose, starch, fruit juices, etc., their feeding being limited to the treated area. This marked preference for certain carbohydrates explains the damage to stuffs spotted or impregnated with these substances under natural conditions. Oviposition takes place at night. In October 1927 with an average temperature of 15° C. [59° F.] hatching took place 26 to 30 days after oviposition ; in June 1928 with an average temperature of 19° C. [66·2° F.] the eggs hatched in 15–20 days. The larval stage lasted about 250 days and the pupal stage 15–20 days, the life-cycle for the September generation occupying approximately 300 days. The larvae never attack sound wood, but feed readily on the débris contained in the galleries of xylophagous insects such as *Anobium*. They can be fed on bran, flour, rhubarb rhizomes, and corks, but they died sooner or later when given woollen stuffs alone. Pupae obtained from larvae hatched in October were always without cocoons [*cf. loc. cit.* and xi, 141]. In spite of the resistance of the adult beetles to asphyxiating gases, such as carbon bisulphide and even hydrocyanic acid, complete mortality of both adults and larvae was obtained under practical conditions in the laboratory with chloropicrin at the rate of 5 cc. to the cubic metre.

TOPI (M.). **L'impiego delle viti selvatiche nella ricostruzione del vigneto.** [The Employment of Wild Vines as Stocks in Replanting Vineyards.]—*Boll. R. Staz. Pat. veg.*, viii, no. 2, pp. 163–173, 6 refs. Rome, April–June 1928.

Wild vines, *Vitis vinifera silvestris*, have proved susceptible to infestation by *Phylloxera* and should not be used as grafting stocks.

Sibilia (C.). **La soda caustica nella fitoterapia.** [Caustic Soda against Plant Pests.]—*Boll. R. Staz. Pat. veg.*, viii, no. 2, pp. 208–215, 1 fig., 2 refs. Rome, April–June 1928.

Experiments have been made in and around Rome with solutions of caustic soda against various Coccids. Except for care in not spraying the leaves no special precautions are needed when using this insecticide against scales infesting the trunks and larger branches. Where the leaves of evergreens, such as mandarin orange, oleander and laurel are attacked, a strength of 1 per cent. must not be exceeded. The end of the winter is the best time for spraying, but as some Coccids have several generations a year, it is advisable to continue treatment, decreasing the strength and avoiding high temperatures when making the application. These precautions are superfluous for palms and Cycads on which a strength of 1·75 per cent. can be used without injury to the mature leaves.

Tempel (W.). **Der gefurchte Dickmaulrüssler** (*Otiorrhynchus sulcatus*, **F.**) **als Azaleenschädling.** [*O. sulcatus* as a Pest of Azaleas.] —*Die kranke Pflanze*, v, no. 7, pp. 106–107, 1 fig. Dresden, July 1928.

Every year more or less extensive injury to the large azalea plantations around Dresden is done by *Otiorrhynchus sulcatus*, F. The adults appear from about mid-May onwards and feed on the young leaves. The eggs are deposited on the soil during the summer, and the larvae hatch in autumn and feed on dead parts of the plants and young roots. In spring they attack the larger roots and the underground part of the stem, stopping the flow of sap and killing the plant. Pupation takes place from the end of April onwards. The weevils were introduced into the azalea plantations with peat from heather and moor land, which is used in large quantities. It is therefore advisable to store such peat in the open for some years. The weevils may be collected by night, and arsenical dusts have given good results, though arsenical sprays have caused scorching. *O. sulcatus* is very resistant to fumigation with hydrocyanic acid gas.

Tempel (W.). **Zur Kohlschabenbekämpfung.** [Work against the Cabbage Moth.]—*Die kranke Pflanze*, v, no. 8, pp. 121–122, 1 fig. Dresden, August 1928.

The larvae of the cabbage moth [*Plutella maculipennis*, Curt.] may be destroyed with arsenical dusts and sprays so long as the hearts of the cabbages have not closed. When this has occurred, the plants may be dusted with a mixture of 1 part tobacco dust and 4 parts lime or one of 5 parts nicotine sulphate and 95 parts lime, or they may be sprayed with nicotine or quassia. After the harvest, all the débris and stalks must be destroyed.

Baunacke (—). **Einige viel beklagte Schädigungen unserer Gartenerdbeere.** [Some Injuries to our Garden Strawberry that have been the Subject of Complaint.]—*Die kranke Pflanze*, v, no. 8, pp. 126–128, 1 pl. Dresden, August 1928.

The raspberry weevil, *Anthonomus rubi*, Hbst., which seems to be increasing on sandy soils, pierces the young strawberry buds in spring in order to oviposit. It does similar injury to raspberry, blackberry and rose. The larva feeds within the bud, and a considerable loss of crop results. Deformations of the strawberry fruits may be due to various causes, the chief of which is attack by the bug, *Lygus pratensis*, L.

WELLENSTEIN (G.). **Beiträge zur Biologie der roten Waldameise** (*Formica rufa*, **L.**) **mit besonderer Berücksichtigung klimatischer und forstlicher Verhältnisse.** [Contributions to the Biology of the Red Forest Ant, *F. rufa*, with special Regard to climatic and forest Conditions.]—*Z. angew. Ent.*, xiv, no. 1, pp. 1–68, 21 figs., 43 refs. Berlin, July 1928.

This is a detailed account of the bionomics of the red forest ant, *Formica rufa*, L., which is now becoming recognised in Germany as of great value in keeping down forest pests.

MENZEL (R.). **Ueber Teeschädlinge in Niederländisch-Indien und ihre Bekämpfung. iv. Zur weiteren Kenntnis des Capsidenparasiten** *Euphorus helopeltidis* **Ferrière.** [On Tea Pests in the Dutch East Indies. iv. Further Knowledge of *E. helopeltidis*, the Parasite of the Tea Capsid.]—*Z. angew. Ent.*, xiv, no. 1, pp. 86–90, 3 figs., 6 refs. Berlin, July 1928.

The extent of the parasitism of *Helopeltis* [*antonii*, Sign.] by the Braconid, *Euphorus helopeltidis*, Ferrière [*R.A.E.*, A, xv, 53] from December 1926 to July 1927 in two tea plantations near Buitenzorg, Java, varied greatly, with an average of 30 per cent. In Sumatra another Capsid, *Pachypeltis vittiscutis*, Bergroth, is also a host. Recently larvae of this Capsid on *Cinchona* in Java have been found to be parasitised by *Euphorus*, probably *E. helopeltidis*. *Euphorus* spp. in the tropics appear to be special parasites of Capsids, including various species of *Helopeltis* and *Sahlbergella singularis*, Hagl. [A, xv, 241]. The incidence of the Ichneumonid hyperparasite, *Stictopisthus javensis*, Ferrière, varied from 4 to 10 per cent.; it has not yet been observed in Sumatra.

MEUNIER (K.). **Experimentelles über den Schwärmtrieb und das periodische Auftreten verschiedener Aktivitätsformen beim Maikäfer** (*Melolontha melolontha* **L.**). [Experiments on the Flight-stimulus and on the periodic Occurrence of various Forms of Activity in *M. melolontha*.]—*Z. angew. Ent.*, xiv, no. 1, pp. 91–139, 19 figs., 6 refs. Berlin, July 1928.

In continuation of Rhumbler's study in 1922–23 of the evening flights of *Melolontha melolontha*, L. [*R.A.E.*, A, xiv, 436], field and laboratory observations were made in 1926–27 on the cause determining the start of the flight. To ascertain if captive beetles showed any particular restlessness in the evening, use was made of the balance-actograph of Szyminski, by which their movements were recorded on a band of paper placed round a rotating cylinder. It is concluded *inter alia* that a certain degree of twilight is a stimulus to flight; this seems a widespread phenomenon among Lamellicorn beetles. *M. melolontha* does not react to this stimulus throughout its life, and an increased activity during the hot hours also occurs.

KREYENBERG (J.). **Experimentell-biologische Untersuchungen über** *Dermestes lardarius* **L. und** *Dermestes vulpinus* **F. Ein Beitrag zur Frage nach der Inkonstanz der Häutungszahlen bei Coleopteren.** [Experimental Investigations on the Biology of *D. lardarius* and *D. vulpinus*. A Contribution to the Question of Inconstancy in the Number of Moults in Coleoptera.]—*Z. angew. Ent.*, xiv, no. 1, pp. 140–188, 22 figs., 83 refs. Berlin, July 1928.

The primary object of these investigations on the biology of *Dermestes lardarius*, L., and *D. vulpinus*, F., was to ascertain the factors governing the larval moults, which vary in number. In Germany *D. lardarius* hibernates in the adult stage, while *D. vulpinus* hibernated in all stages in the breeding box ; the stages in which it hibernates may depend on the temperature. At 28° C. [82·4° F.] and with abundant food, the young females of *D. lardarius* require 3½ months to develop their ovaries. In unheated attics or cellars, *D. lardarius* usually passes the winter in the shelters bored by the larvae in floor-timber, stuffed animals, etc. At an outdoor temperature of –3° C. [26·6° F.] the beetles become rigid, but can revive after 24 hours' exposure. In April they become ready to feed, and they pair at the end of April and early in May provided that there is an average minimum day temperature of 16–18° C. [60·8–64·4° F.]. Oviposition takes place in dark places near food suited to the larvae. From 102 to 174 eggs each were laid by six females of *D. lardarius*, while 648 and 845 eggs were laid by two females of *D. vulpinus*. During the period of pairing and oviposition both sexes avoid light, but at other times they come into it when hungry.

During the first part of the larval life, which includes 1–5 moults in *D. lardarius* and 1–6 in *D. vulpinus*, the larva is feeding constantly, but after the penultimate moult, it feeds very little and wanders in search of a suitable place for pupation. The larvae of *D. vulpinus* prefer hides and skins, those of *D. lardarius* ham, bacon, cheese, meat, etc. Fresh lard or fat clog the mouth-parts and are avoided. A larva wandering in search of a place for pupation bores into any obstacle that comes in its path, hence the records of injury to timber, tobacco, leather, etc. The pre-pupal stage varies in duration according to sex and temperature ; that of the pupal stage extends from 8 to 14 days. In these experiments the females emerged about a month after the males. Normally, the male larvae of *D. lardarius* moult 4 times, the females 5 ; at 28° C. [82·4° F.] the males moult 5 times, the females 6. The highest number of moults observed was 7, for a female of *D. vulpinus*. Increase of moisture or lack of food does not increase the number of moults, but the former prolongs the total larval period. The optimum temperature seems to be between 18 and 20° C. [64·4–68° F.].

DINGLER (M.). *Cartodere filiformis* **Gyll. und** *C. filum* **Aubé (Ord. Coleoptera Fam. Lathridiidae) als Schädlinge in Hefepräparaten.** [*C. filiformis* and *C. filum* as Pests in Preparations of Yeast.]—*Z. angew. Ent.*, xiv, no. 1, pp. 189–224, 24 figs., 1 pl., 19 refs. Berlin, July 1928.

Investigations were begun in 1923 as a result of the receipt from Bavarian factories of samples of dried yeast infested by the Lathridiid beetles, *Cartodere filum*, Aubé (the predominant species) and *C. fili-*

formis, Gyll., descriptions of which are given. Since then, other complaints have shown that these beetles are obstinate pests that sometimes succeed in infesting the yeast, which is prepared for medicinal use, in spite of all precautions, and they can remain alive and breed inside the tins in which the material is sold. Both the adult and the larva can ascend the vertical surfaces of tin or even glass if not too smooth. The larva avoids daylight, as does the adult to a less degree, but the latter is attracted by artificial light. In winter (at room temperature) the larval stage lasts 2–3 months and the pupal stage 2. The beetles wander, presumably prior to mating, as do the larvae before the pre-pupal period. Most new infestations may be ascribed to the wandering adults, which can live without food for 6 months. Both adults and larvae feed on the fine particles of yeast adhering to the larger grains, the damage due to pollution being greater than that due to feeding. Infestation of tins can occur only in the interval between drying the yeast and sealing the containers with gummed wrappers. Heating at over 60° C. [140° F.] and fumigation with hydrocyanic acid gas are effective remedies.

[Troitzkiĭ (N. N.).] Troitzky (N.). **Die Ueberwinterung des Apfelblütenstechers** (*Anthonomus pomorum*, **L.**). [The Hibernation of the Apple Blossom Weevil.]—*Anz. Schädlingsk.*, iv, no. 8, pp. 103–109, 23 refs. Berlin, 15th August 1928.

A detailed account is given of investigations made in Russia in 1925–27 on the hibernation of *Anthonomus pomorum*, L. The results are summarised as follows : The assemblies of resting adults of the apple blossom weevil in winter in various places depend on the physical conditions of the surroundings. The following conditions are requisite : Good ventilation ; a moderate degree of moisture ; slight permeability to light ; and low conductivity to warmth. The bark of the food-plant best fulfils these conditions. The ground at the foot of the tree is less suitable because of the large variations in its moisture. The lack of old, loose bark on trees in a well-tended garden makes hibernation there difficult, and the weevils migrate to neighbouring parks and woods, returning to the apple trees in spring.

Schedl (K. E.). **Erwiderung zum Aufsatze : Verkümmern und Verderben von Bruten forstschädlicher Insekten von Forstrat Alois Nechleba, in Heft 10, 1927.** [A Reply to the Paper by Forstrat A. Nechleba " The Loss of Vitality and Destruction of Broods of Forest Insect Pests," in Part 10, 1927.]—*Anz. Schädlingsk.*, iv, no. 8, pp. 109–111. Berlin, 15th August 1928.

According to Nechleba the Scolytid, *Myelophilus piniperda*, L., is one of the forest insects in which decrease and cessation of reproduction are a factor in ending outbreaks [*R.A.E.*, A, xvi, 4]. The author suggests that in the case observed, *M. piniperda* was killed by the excessively high temperature such as may easily occur under the bark on the sunny side of a trunk, especially where, as in this case, there was no normal cooling flow of sap owing to previous injury by fire.

Commenting on the above, Nechleba states that the conditions did not indicate external adverse influences but a lack of reproductive power in the female beetles, such has been proved to occur in *Ips typographus*, L., and *Hylastes* (*Hylurgops*) *glabratus*, Zett.

Ein neuer Kiefernschädling. [A new Pest of Pines.]—*Anz. Schädlingsk.*, iv, no. 8, p. 114. Berlin, 15th August 1928.

Eckstein and Krause have recorded, independently of each other, the occurrence of *Tortrix politana*, Hw., injuring the needles of one-year-old pines. The larva remains in a tube of needles spun together and pupates there. *T. politana* is a widely distributed species and occurs on many plants. Both observers received this pest from Silesia, where large pine plantations have been destroyed. Krause bred some parasites, but no particulars of them are given.

TEMPEL (W.). **Ueber eine Arsenbekämpfung der Nonnenraupen mittels Flugzeugen.** [On an Instance of Work with Arsenic against Nun Moth Caterpillars by Means of Aeroplanes.]—*Die kranke Pflanze*, v, no. 9, pp. 144–147, 5 figs. Dresden, September 1928.

During the winter of 1927–28, eggs of the nun moth [*Lymantria monacha*] were abundant in the extensive pine woods of the forestry division of Tiergarten, Prussia, up to 3,000 eggs being noticed on one trunk. About 4,000 acres were dusted by aeroplane between 13th June and 20th July 1928 with a preparation of arsenic containing 18 per cent. As_2O_5. By spreading sheets of paper of about 20 sq. ft. in area it was easy to see the dead bodies of the caterpillars and the amount of larval excreta. The insecticide used is very finely powdered and has good adhesive power; consequently the heaviest deposit was in the tree crowns, and the ground was only lightly covered. No injury to animals and birds was reported.

[UGRYUMOV (G. D.).] **Угрюмов (Г. Д.). Works of the Scientific-Experimental Laboratory of Poisons with Regard to chemical Methods of Control of the Asiatic Locust in 1926.** [*In Russian.*]—*Défense des Plantes*, v, no. 2, pp. 147–150. Leningrad, July 1928.

This is a short account of the objects of experiments carried out during 1926 with various arsenical dusts suitable for application from aeroplanes against the Asiatic locust [*Locusta migratoria*, L.]. The details are dealt with in the subsequent papers.

[PUKHOV (B. A.).] **Пухов (Б. А.). The Avio-Chemical Experimental Expedition for the Control of the Migratory Locust in Daghestan in 1926.** [*In Russian.*]—*Défense des Plantes*, v, no. 2, pp. 151–159, 3 figs. Leningrad, July 1928.

This is an account of the general organisation and equipment of the expedition to Daghestan in 1926 for the control of locusts [*Locusta migratoria*, L.] by means of aeroplanes. Sodium arsenite and Paris green were used at the average rate of about 1¾ lb. to the acre. Under local conditions the most favourable time for dusting was before sunrise or in the evening. A dust cloud 260 yards wide has its maximum efficiency in the central zone of about 110 yards where from 75 to 100 per cent. of the locusts are killed. The excellent results obtained during these experiments have demonstrated the value of aeroplane dusting in the control of locusts, particularly in flooded areas where no other means are applicable.

[Parfent'ev (I. A.).] **Парфэнтьэв (И. А.). Report of the experimental Work of the Avio-Chemical Expedition in 1926.** [*In Russian.*]—*Défense des Plantes*, v, no. 2, pp. 161–168. Leningrad, July 1928.

Tests of various arsenicals show that the calcium salts of arsenic have a much higher toxicity to locusts than the sodium salts. Further details are given in a subsequent paper.

Laboratory tests with cockroaches have proved that sodium arsenite is also a contact poison and is more effective in solution than in a dust. Solutions of sodium arsenite remain in droplets on the chitinous covering of the cockroaches, but when soft soap is added to the solution it spreads evenly over the whole insect. Under laboratory conditions this difference had little influence on the ultimate effect of the poison, but under natural conditions the insects would probably be able to shake a great deal of it off if it did not spread.

Field experiments on locusts have proved that arsenicals may be contact poisons, since, when they were used in high concentrations, the locusts succumbed without moving from the spot on which they were hit by the spray. When the usual concentrations were used, the mortality was less than is generally obtained; this was probably owing to the fact that the spray did not cover the leaves of the reeds evenly and the droplets rolled off.

[Korotkikh (G. I.).] **Коротких (Г. И.). The technical Organisation of the Avio-Chemical Expedition in Daghestan in 1926.** [*In Russian.*]—*Défense des Plantes*, v, no. 2, pp. 169–186, 1 fig. Leningrad, July 1928.

This is an account of technical points in the organisation of the expedition, such as the allotment of the work, the equipment of aeroplanes, etc.

[Vuishelesskaya (N. S.) & Parfent'ev (I. A.).] **Вышелесская (Н. С.). и Парфентьэв (И. А.). A Study of the Toxicity of various Preparations of Arsenic to Locusts.** [*In Russian.*]—*Défense des Plantes*, v, no. 2, pp. 187–196. Leningrad, July 1928.

In continuation of work on the toxicity of arsenicals to cockroaches [*R.A.E.*, A, xv, 510], various compounds have now been tried against locusts. A detailed account is given of the technique employed in ascertaining the lethal dose of arsenic per unit of leaf surface as well as the amount of poisoned leaf eaten by the locusts. In field experiments, the area of the leaf surface of the reed-beds was estimated, and it was found that 1¾ lb. or more of sodium arsenite to the acre of leaf surface was necessary to kill all locusts in the fourth instar; half this quantity caused considerable mortality, but smaller doses had no effect. Twice this strength was necessary to kill the fifth instar locusts. The arsenical is probably also a repellent, as a larger quantity of the leaves was eaten on the untreated plots. Laboratory experiments in which locusts were fed on leaves collected from the treated area indicated that ⅞ lb. to the acre of leaf surface should apparently be sufficient to kill the locusts, but it is possible that the full amount of the arsenic reaching the leaves was not accurately determined, as in nearly all cases the leaves were scorched. In such cases part of the arsenic probably combined with the leaf tissue and was no longer soluble in water.

Laboratory experiments with arsenites and arsenates of sodium and calcium containing varying proportions of oxides are discussed, the poison being administered by means of baits of maize meal. In all cases except two it was found that the calcium arsenite gave a higher percentage of mortality in a given time than the sodium arsenite, while a sodium arsenite containing 85 per cent. of As_2O_3 killed the locusts more quickly than one containing only 42 per cent. Calcium arsenite and calcium arsenate are almost equally toxic, the results being sometimes in favour of the one and sometimes of the other; the arsenic content in the present experiments was very high in both cases. The symptoms exhibited by the poisoned locusts are described, and the poison content of the dead individuals is shown in a table.

[VITKEVICH (V. I.).] **Виткевич (В. И.). The Rapidity of the Settling of fine Particles. Preliminary Note.** [*In Russian.*]—*Défense des Plantes*, v, no. 2, pp. 199–204, 2 figs. Leningrad, July 1928.

In comparative tests of various dusts, it was found that Paris green, owing to the evenness of the particles, remains most compact in falling, while sodium arsenite and calcium arsenate diffuse more slowly through the air. The large particles of Paris green fall more slowly than the large particles of other substances as they consist of a loose mass of smaller particles, whereas the large particles of the other substances are either crystals or a compact mass of smaller particles.

In comparing sulphur, chalk, lime and gypsum, it was found that all the particles of sulphur fall most rapidly owing to their crystalline structure, while the others, in the order of most rapid settling, are, for the large particles, gypsum, lime and chalk, and for the medium particles, chalk and lime; while of the small particles lime falls quicker than gypsum. The particles of these three substances are amorphous.

Paris green was combined with the various carriers, and though in the case of lime, the large particles of the carrier fell first, a large portion of the dust fell as a mixture.

Damp dusts fall more quickly than dry powders and, in the case of Paris green, less evenly. Paris green and sodium arsenite when dropped together do not combine, each substance falling as though dropped alone, whereas in the case of Paris green and calcium arsenate the particles unite and fall at the average rate of the two substances.

[VUISHELESSKAYA (N. S.), GALAKHOV (P. N.), ZARRING (I. I.) & PARFENT'EV (I. A.).] **Вышелесская (Н. С.), Галахов (П. Н.), Зарринг (И. И.) и Парфентьев (И. А.). Determination of the Width and Character of the Dust Cloud in Aeroplane Dusting.** [*In Russian.*]—*Défense des Plantes*, v, no. 2, pp. 205–212. Leningrad, July 1928.

The width of the dust cloud, when dusting from aeroplanes, depends on the height at which the machine is flown, while the quantity of dust alighting on a unit of area, other conditions being equal, depends on the quantity released. The poison is unevenly distributed throughout the dust cloud, the bulk falling along the line of flight. Under conditions of slight precipitation and wind, the poison will remain on the plants for several days, but it is washed off by rain.

In the experiments under review the aeroplanes were flown at heights varying from 10 to 82 ft., but only a strip of about 110 yards of the dust cloud can be relied on for locust control. Further experiments are necessary to ascertain the reason why the bulk of the poison covers a comparatively narrow strip, and to improve the technique and apparatus used.

In testing the amount of sodium arsenite on the leaves, it was found that 0·0075–0·0333 mgm. to 1 sq. cm. killed 95–100 per cent. of the locusts.

[KOROTKIKH (G. I.).] **Коротких (Г. И.). The Width of the Cloud of Insecticides applied by Aeroplane.** [*In Russian.*]—*Défense des Plantes*, v, no. 2, pp. 213–222, 5 figs. Leningrad, July 1928.

The entire width of the dust cloud does not depend on the amount of dust released from the aeroplane in a unit of time, but the width of the effective strip may depend on the quantity of poison released. In practice this strip is not affected by the speed or direction of the wind within the limits of conditions suitable for flying (wind from 0 to 13 ft. per second).

Low flying over the reed beds is not always safe, and dusting from higher levels was therefore tried, but as the efficiency of the dust is lessened under such conditions by factors not yet understood, it is recommended that at present the aeroplanes should fly at a height of 10–25 ft. above the vegetation.

The difference between the amount of poison theoretically calculated to alight on the dusted leaves and that proved by analysis to be present is discussed ; the latter quantity is always the smaller. The physical qualities of the insecticides and the amounts released from the aeroplanes should be studied in an effort to reduce this discrepancy.

[SABIN-GUS (B. I.).] **Сабин-Гус (Б. И.). Meteorological Observations in the Daghestan Flood Areas during the Avio-Chemical Expedition in the Summer of 1926.** [*In Russian.*]—*Défense des Plantes*, v, no. 2, pp. 223–234, 19 figs. Leningrad, July 1928.

This is a detailed account of the weather conditions prevailing during the work of the expedition.

[KOROTKIKH (G. I.).] **Коротких (Г. И.). The Migratory Locust and the Avio-Chemical Method of Control.** [*In Russian.*]—*Défense des Plantes*, v, no. 2, pp. 235–240, 7 figs. Leningrad, July 1928.

This is a short account of the use of aeroplanes for the application of sodium arsenite dust for the control of the migratory locust [*Locusta migratoria*, L.] in the adult stage as an emergency measure in the North Caucasus. The poor results obtained indicate the importance of further experimental work. Sodium arsenite is a contact as well as a stomach poison, though its contact action depends on a sufficient amount of humidity in the atmosphere. It can only act as a stomach poison if the locusts remain on the treated vegetation long enough to resume feeding. The best time for dusting from aeroplanes is in the evening, but during the operations described the locusts did not settle until it was too dark for the work to be done, and when dusting was attempted in the early morning, the swarm took flight on the appearance of the aeroplanes. These difficulties are not present in dealing with the immature stages, as although they take fright at the appearance of the machines, they remain on the treated area and feed there.

[Zarring (I. I.).] **Зарринг (И. И.). On the Solubility of Arsenic Trioxide.** [*In Russian.*]—*Défense des Plantes*, v, no. 2, pp. 241–243. Leningrad, July 1928.

Experiments to test the solubility of arsenic trioxide (As_2O_3) are described. When the arsenic was placed in boiling water and kept boiling the solution contained 8·3 per cent. after boiling for 5 minutes and 9·9 after boiling for an hour, when a state of equilibrium was reached. Immediately upon cooling, the arsenic trioxide begins to crystallise out, though the process is very slow. When placed in cool water (25° C. [77° F.]) and kept at the same temperature in the thermostat, the arsenic trioxide dissolved much more slowly, an equilibrium only being reached after 5–6 days. During this period, the solution was agitated at intervals.

[Mikhaĭlov-Senkevich (Ya. M.).] **Михайлов-Сенкевич (Я. М.). Report on the Work of the Technical Department of the Avio-Chemical Expedition for the Control of *Psilura monacha*, L., in the Government of Nizhni-Novgorod in 1926.** [*In Russian.*]—*Défense des Plantes*, v, no. 2, pp. 245–254. Leningrad, July 1928.

In view of the successful results obtained with aeroplane dusting for the control of locusts, the same method has been tried against *Lymantria* (*Psilura*) *monacha*, L., which attacked a large forest area in the Nizhni-Novgorod Government in 1926. A detailed account of the work and of the difficulties encountered under local conditions is given. It was found that the movement of the dust cloud is at first influenced by the rotation of the propeller, but later largely depends on the wind and air currents. In the early morning a descending air current forced the poison towards the earth so that the dust cloud could not remain suspended or be driven by the wind. After the air has gradually been warmed by the sun and the air currents reach a condition of equilibrium, the dust cloud remains suspended in the air or is easily driven by the wind. The evening is less satisfactory for such operations, as the air is too hot and the dust cloud cannot settle evenly.

[Ponomarenko (D. A.).] **Пономаренко (Д. А.).** ***Plagiognathus albipennis*, Fall., as a Pest of Agricultural Plants.** [*In Russian.*]—*Défense des Plantes*, v, no. 2, pp. 268–270, 1 ref. Leningrad, July 1928.

Owing to the rainy and comparatively warm spring of 1926, the Capsid, *Plagiognathus albipennis*, Fall., appeared in large numbers in the middle Volga region and seriously infested grain crops and vegetables. The larvae were discovered in the first third of May, when they attacked exclusively winter rye and spring wheat. The larvae keep very close together forming compact masses. They occurred chiefly on the borders of fields in places overgrown with weeds, from which they migrated to the grain crops, the injury to these gradually increasing. In the second third of May the larvae began to transform into nymphs, and owing to the damage done by them, the rye and wheat dried out. The nymphs are general feeders and cause considerable damage to vegetables. Only about 30–40 per cent. of the vegetable plants recovered from the attack, but all the cereals recovered owing to abundant rains. In the last ten days of May, when the insects became adult, they dispersed and the damage done by them was very slight. The best method for the control of *P. albipennis* was spraying, as sweeping damaged a great number of the plants. Sprays of soap solution or kerosene emulsion proved effective against the larvae and nymphs but not against the adults, which were very difficult to hit with the spray.

KOZHANTSCHIKOV (I.). **New Biometrical Investigation of the** *Phylloxera*-**Races.**—*Z. indukt. Abstamm. Vererbungsl.*, xlvii, no. 3, pp. 270–274. Leipzig, 1928.

The author gives figures showing the lengths of the bristles of the forms of *Phylloxera* found on the one-year-old and older roots of European and various American vines, which give curves of inverse meaning to those of Börner. The author's investigations indicate that there is only one form of *Phylloxera* in Transcaucasia though according to Börner's theory both forms should be represented [*R.A.E.*, A, xi, 433].

[SKALOV (Yu.).] **Скалов (Ю.).** *Locusta migratoria*, **L., and its Control in Kuban during the Period 1874-1927. (Historical Review.)** [*In Russian.*]—*Bull. N. Caucas. Pl. Prot. Sta.*, no. 4, pp. 71–116, 5 diagrs., 2 maps, numerous refs. Rostov-on-Don, 1928. (With a Summary in German.)

The reed-beds along the lower part of the course of the river Kuban and along the shores of the Azov Sea represent a permanent breeding area of *Locusta migratoria*, L. In some years, swarms of locusts produced in these places, which are mostly inaccessible, invade the adjoining steppes and foothills of the Caucasus. The first record of locusts in the Kuban province refers to 1874; and more or less serious outbreaks were recorded in the years 1881, 1883–1887, 1921, 1922 and 1923. Thus, there was no definite periodicity of outbreaks.

A detailed historical account of all outbreaks is given, and it is concluded that chemical methods are effective in their control, but that their prevention can only be attained by drainage and cultivation of the breeding areas.

[ZAKHAROV (L. Z.).] **Захаров (Л. З.). The Status of the Breeding Areas of** *Locusta migratoria*, **L., in the North Caucasian Region and along the River Kuma in the Daghestan and the Kalmuck Autonomous Province in 1927-28.** [*In Russian.*]—*Bull. N. Caucas. Pl. Prot. Sta.*, no. 4, pp. 117–121, 1 ref. Rostov-on-Don, 1928. (With a Summary in German.)

Locusta migratoria, L., which occupied in 1926 an area of over 150 sq. miles in the North Caucasus, was successfully exterminated in its early hopper stages. Nevertheless, the locust danger is not completely averted, since in the reed areas along the rivers Kuma and Kuban egg-deposits to the extent of 85 sq. miles were recorded in the autumn of 1927.

[Sokolov (P. T.).] **Соколов (П. Т.). On the Question of Chemical Control of Locusts.** [*In Russian.*]—*Bull. N. Caucas. Pl. Prot. Sta.*, no. 4, pp. 122–126. Rostov-on-Don, 1928. (With a Summary in German.)

A brief account is given of experiments carried out in 1925 in the North Caucasus. Literature on the effect of arsenic on insects is reviewed. One of the main points of the investigations was to ascertain the toxicity of various arsenical preparations, especially sodium arsenite, calcium arsenate and Paris green, to *Locusta migratoria*, L. The dusts were applied by aeroplane. Even the heaviest applications of calcium arsenate gave a much lower mortality than much lighter ones of sodium arsenite ; Paris green was slightly less effective than the latter. The solubility of the poison, though not the only factor, is an important one affecting the toxicity of the dust.

[Belyaev (K. A.) & Novitzkiĭ (P. N.).] **Беляев (К. А.) и Новицкий (П. Н.).** *Phylloxera* **Observations in the Black Sea Region.** [*In Russian.*]—*Bull. N. Caucas. Pl. Prot. Sta.*, no. 4, pp. 127–196, 43 refs. Rostov-on-Don, 1928. (With a Summary in German.)

The viticultural conditions in the Caucasus since 1882 are reviewed, and the results of observations during the three years 1925–27 on the distribution of *Phylloxera* in the Black Sea Region are discussed. The fact that this Aphid has only recently been discovered is partly due to the predominant vine grown by the peasants being a variety of the American *Vitis labrusca*, which, though heavily attacked, is not affected by the infestation, as the Aphids do not form galls on the leaves. In general, the spread of *Phylloxera* under local conditions is very slow, and the attacked vines survive and remain fruitful for a considerable time.

[Sukhorukov (N. N.).] **Сухоруков (Н. Н.). Observations on** *Phylloxera* **in the former Kuban Region in 1927.** [*In Russian.*]—*Bull. N. Caucas. Pl. Prot. Sta.*, no. 4, pp. 197–201. Rostov-on-Don, 1928. (With a Summary in German.)

As a result of a careful survey of the vineyards in the Kuban region, carried out between June and September, it is stated that *Phylloxera*, though present, is not a serious menace. Even in infestations of fairly long standing, the decline in vigour of the vines has been mainly due to other causes.

[Troitzkiĭ (N. N.).] **Троицкий (Н. Н.). Some of the more important Problems of** *Phylloxera* **Control in the Black Sea Region.** [*In Russian.*]—*Bull. N. Caucas. Pl. Prot. Sta.*, no. 4, pp. 202–204. Rostov-on-Don, 1928. (With a Summary in German.)

It is suggested that in order to prevent the further spread of *Phylloxera* in the Black Sea Region, suitable quarantine measures should be promulgated to protect the northern areas, in which direction the Aphids tend to migrate, while in suitable parts of the infested area the cultivation of dessert grapes should be undertaken.

[Balakhonov (P. I.).] **Балахонов (П. И.). The Injury caused by** *Harmolita* **to Winter Rye in the Salsk Region.** [*In Russian.*]—*Bull. N. Caucas. Pl. Prot. Sta.*, no. 4, pp. 205–209. Rostov-on-Don, 1928. (With a Summary in German.)

The species of *Harmolita* infesting winter rye during 1926 in the Salsk region were *H. eremita,* Portsch., *H. eremita* var. *nodalis,* Rim.-Kors., and *H. rossica,* Rim.-Kors. A careful analysis of the injured stems and a comparison of the weight of the grain in injured and uninjured plants has proved that these species are of no economic importance as regards this crop.

[Arkhangel'skiĭ (N. N.).] **Архангельский (Н. Н.). Rhynchitini of the North Caucasian Region.** [*In Russian.*]—*Bull. N. Caucas. Pl. Prot. Sta.*, no. 4, pp. 210–221, 3 figs., 17 refs. Rostov-on-Don, 1928. (With a Summary in German.)

Notes are given on the distribution and habits of 15 species of this tribe of weevils in the North Caucasian region. They include the following orchards pests: *Rhynchites tomentosus,* Gyll., found on quince, apple and pear ; *R. pauxillus,* Germ., a common pest of the leaves and buds of fruit trees ; *R. aequatus,* L., which occurs on apples, but does not cause much damage ; *R. coeruleus,* DeG., occurring on apples, pears and less frequently on quince, plum and sloe ; *R. auratus,* Scop., damaging the buds, young shoots and leaves of cherries, sloe, plums and pears ; *R. bacchus,* L., which shows a preference for small apples for oviposition ; *R. versicolor,* Costa, which is particularly injurious in the spring, attacking the buds and young tips of branches, especially of pears, though apple and other trees may also be attacked (the morphology of the larva is described) ; and *Byctiscus betulae,* L., occurring on the tips of the branches of various trees, but particularly on pears, vines, apple and poplar.

[Vladimirskaya (L. I.).] **Владимирская (Л. И.).** *Anisoplia,* **Serv., in the North Caucasian Region.** [*In Russian.*]—*Bull. N. Caucas. Pl. Prot. Sta.*, no. 4, pp. 222–234, 1 map, 2 pls., 54 refs. Rostov-on-Don, 1928. (With a Summary in German.)

During three years' work in the North Caucasus, the following species of *Anisoplia* have been recorded: *A. austriaca major,* Rttr., *A. cyathigera,* Scop., *A. segetum,* Hrbst., *A. zwicki,* Fisch., *A. deserticola,* Fisch., *A. signata,* Fald., *A. campicola,* Mèn., and *A. remota,* Rttr. The identity of the last named is somewhat doubtful, as the species has previously only been recorded from western Europe. Notes are given on the seasonal history and distribution of these beetles, the first three being the most important grain pests, while the last three are recorded for the first time from this region. A key to the larvae is included, and the mature larva of *A. cyathigera* is described.

[ROMANOVA (V. P.).] **Романова (В. П.). Injurious Species of *Lixus*, F., in the North Caucasian Region.** [*In Russian.*]—*Bull. N. Caucas. Pl. Prot. Sta.*, no. 4, pp. 235–242, 1 pl., 18 refs. Rostov-on-Don, 1928. (With a Summary in German.)

The injurious species of *Lixus* occurring in the North Caucasus are *L. subtilis*, Sturm, a pest of beet, and *L. myagri*, Oliv., and *L. ascanii*, L., attacking cabbages. Previous records of other weevils of this genus in Russia are briefly reviewed, but none of them has so far been found to be of economic importance in the North Caucasus. The distribution of the three species mentioned is discussed, and notes are given on their seasonal habits. *L. subtilis* is recorded for the first time as a pest of beet, to which it caused considerable injury during 1925–27. The adults feed on the leaves, and the larvae and pupae occur in the leaf-stalks and in the stems of beet grown for seed. As the stems thus attacked are easily broken by the wind and wither early, the crop is lost. The injured leaves also wither. The larvae and pupae also occur in large numbers in weeds (*Amarantus*, *Atriplex* and *Chenopodium*). There is one generation a year, the eggs being found from June to August ; they are laid in the petioles, the older and better developed leaves being preferred, or in the stems, particularly in the upper half. The first larvae were found at the beginning of July in 1926 ; a considerable number of them entered a diapause during the second or third instar and continued their development in the following spring. At first the development of the larvae in leaf-stalks and stems runs parallel, but later the development of those in the petioles is retarded, and many die owing to the excessive moisture of the tissues of the leaf-stalks. Sometimes the withered leaves fall before the larvae have mined to the end of the stem, where they usually pupate, and in that case they emerge and pupate in the soil. The first pupae were found during the latter half of July ; many of them pass the winter in the stem, though some adults emerge and hibernate under fallen leaves.

Both the eggs and larvae are attacked by natural enemies ; these include the ant, *Tetramorium caespitum*, L.

[EGOROVA (K. P.).] **Егорова (К. П.). Experiments with Poison Baits for the Control of Ants—Vegetable Pests.** [*In Russian.*]—*Bull. N. Caucas. Pl. Prot. Sta.*, no. 4, pp. 243–248, 9 refs. Rostov-on-Don, 1928. (With a Summary in German.)

The ants, *Formica rufibarbis*, L., *Tetramorium caespitum*, L., and *Lasius niger*, L., cause considerable damage to leaf-buds of fruit trees and especially to young seedlings of cabbage, beet, etc., in the North Caucasus. Poison baits broadcast amongst the seedlings have given very promising results. The baits consisted of wheat bran, water and sodium arsenite, at the rate of 40, 30–40 and 1 parts by weight. The bait should be applied in the evening or early morning to ensure the retention of moisture for as long as possible. All nests should be destroyed.

[Dovnar-Zapol'skiĭ (D. P.).] **Довнар-Запольский (Д. П.). On Stem Sawflies of the Genus** *Cephus*, **Latr.** [*In Russian.*]—*Bull. N. Caucas. Pl. Prot. Sta.*, no. 4, pp. 249–254, 9 figs., 2 refs. Rostov-on-Don, 1928. (With a Summary in German.)

As a result of a study of the material in the Museum of the Academy of Science, Leningrad, and in other collections, a key has been prepared of the species of the genus *Cephus* occurring in U.S.S.R. Notes are also given on their distribution and characters.

[Lappin (G. I.).] **Лаппин (Г. И.). The Effect of the Solution of Caustic Soda on Rubber and Leather Parts of Sprayers.** [*In Russian.*—*Bull. N. Caucas. Pl. Prot. Sta.*, no. 4, pp. 261–263. Rostov-on-Don, 1928. (With a Summary in German.)

Experiments by F. N. Lebedev in 1927 with solutions of caustic soda for the control of the migratory locust [*Locusta migratoria*, L.] proved that the locusts in all stages were killed as soon as even a very small amount of a 5 per cent. solution touched them. In view of this, the North Caucasian Regional Station for the Protection of Plants has tested the action of solutions of caustic soda on the different parts of sprayers, and it has been found that the parts made of leather or of white or black rubber are little affected by even strong solutions (up to 10 per cent.) acting for as long a period as five days. Valves made of red rubber, which are usually used in knapsack sprayers, could all withstand a weak solution (3 per cent.), but were affected by solutions of 5 per cent. in six hours. It is therefore advisable to use black or light-coloured rubber in all these parts of a sprayer.

[Piontkovskiĭ (Yu. A.).] **Пионтковский (Ю. А.). A Mite of the Subgenus** *Epitetranychus*, **Lacher, as Pest of Cotton in Turkestan.** [*In Russian.*]—*Khlopkovoe Delo* [*Cotton Indust.*], vii, no. 5–6, pp. 365–370, 10 refs. Moscow, 1928.

The mite that attacks cotton in Turkestan and has previously been recorded as *Tetranychus telarius*, L., is an undescribed species of the subgenus *Epitetranychus*. Detailed descriptions of the female, the larva and the egg are given. Like other Tetranychids, this mite is a general feeder and may hibernate in various stages. It is active from the middle of March till late in October, 10–13 generations occurring during the year. Oviposition begins in the second half of March. The female lays as many as 182 eggs, and these hatch within 10 days in the spring and autumn and in 3 to 5 days in the summer, the average life-cycle from egg to adult varying from 9·5 days in August to 24·5 days in April. Females may reproduce parthenogenetically, when only males result. The mites may be distributed by strong winds, which carry infested leaves for long distances, and when cotton is closely planted, infestation may result through the contact of healthy and injured leaves. They begin to be injurious by the end of June, the webs made by them causing a large number of leaves to wither and drop. The injury increases especially in August and lasts till the beginning of October. In 1926, 50 per cent. of the crop of cotton was lost owing to the dropping of the bolls. The most usual remedial measures are dusting with sulphur or spraying with flour paste or soap solution. Of these the sulphur dust is least effective, as although the mites disappear within 5–6 days, the eggs on the leaves are unaffected. Spraying with a solution of wheat-flour paste or with 1 lb. soap to 9 gals. water, when the plants were in full bloom, proved the most satisfactory measure. The mites are attacked by the adults and the larvae of *Stethorus punctillum*, Ws., and *Scolothrips sexmaculatus*, Perg., and the larvae of *Feltiella* (*Arthrocnodax*) *tetranychi*, Rübs., *Triphleps nigra*, Wolff, and *Anthocoris cursitans*, Fall.

[YAKHONTOV (V. V.).] **Яхонтов (В. В.). On the Inefficacy of a single Application of Soap as Control Measure against** *Thrips flavus*, **Schr., on Cotton.** [*In Russian.*]—*Khlopkovoe Delo* [*Cotton Indust.*], vii, no. 5–6, pp. 371–373, 4 refs. Moscow, 1928.

Though *Thrips flavus*, Schr., on cotton in Bokhara can be killed by a single application of soap solution (about 1 lb. to 6 gals. water), the plants soon become re-infested by larvae and adults, from various grasses and weeds. A single application of the spray is therefore only effective when all the weeds surrounding the cotton fields are included.

NUNBERG (M.). **Notatki ipidologiczne z Gorganów (Karpaty wsch.).** [Notes on Scolytids in Gorgany (East Carpathians)].—*Polsk. Pismo ent.*, vi (1927), no. 3–4, pp. 211–215, 1 fig. Lemberg, 1928. (With a Summary in German.)

A list of bark-beetles collected during August 1925 in the East Carpathians is given with notes on their food-plants (mainly conifers) and distribution. The typical form of *Ips* (*Pityogenes*) *bistridentatus*, Eichh., and its variety, *conjunctus*, Reitt., were found together in the same tree, and the author does not consider that the latter is worthy of varietal rank.

[MORRIS (H. M.).] **Entomology.**—*Rep. Direct. Agric. Cyprus 1927*, pp. 20–21. Nicosia, July 1928.

The following insects mentioned in this report have not been recently recorded from Cyprus [*cf. R.A.E.*, A, xvi, 345, etc.] : *Prays oleellus*, F., and *Dacus oleae*, Gmel., on olive, and *Acidia heraclei*, L., on celery.

LESTAGE (J. A.). **Recherches sur des névroptères** (*sensu lato*) **coccidophages récoltés en Algérie par M. Balachowsky (1re note).**—*Bull. Soc. Hist. nat. Afr. N.*, xix, no. 4, pp. 150–155, 15 refs. Algiers, April 1928.

The insects discussed in this paper on coccidophagous Neuroptera collected in Algeria include *Megalomus balachowskyi*, sp. n., reared from larvae on *Strelitzia augusta* associated with *Pseudococcus nipae*, Mask.

BALACHOWSKY (A.). **Contribution à l'étude des coccides de l'Afrique mineure. 3e note.** *Chrysomphalus aonidum*, **L., biologie—traitement.**—*Bull. Soc. Hist. nat. Afr. N.*, xix, no. 4, pp. 156–180, 1 pl., 2 figs., numerous refs. Algiers, April 1928.

This study of *Chrysomphalus ficus*, Ashm. (*aonidum*, auct.), a Coccid extremely injurious to *Citrus* and a large number of ornamental plants, includes keys to the species of *Chrysomphalus* in North Africa. The distribution and origin of the scale are discussed, and a list of the food-plants is given. It can only move from one food-plant to another during the short active larval period immediately following hatching, and can only develop in a warm constant temperature with a high degree of humidity. These conditions are only realised in Algeria in a few places on the coast. The injury caused to *Citrus* is described, with details of the susceptibility of the species. Oviposition takes place in September and October, lasting about a month for each individual, and the total number of eggs laid is about 60. The larvae hatch in 1–3 days and are very active until they become attached to the plant, usually 12 or 14 hours later. The nymphs develop slowly between October and April, when the females become adult and begin to lay the eggs of the first generation. The fourth or hibernating generation, which takes about 7 months to develop, suffers a heavy mortality, so that the first generation is usually small. The second generation begins about the end of June, and the third about mid-August. The fall of foliage that occurs on orange trees at the end of February and beginning of March just before blossoming is augmented by the presence of fourth generation nymphs of *C. ficus*, but the chief damage is done in September during the development of the third. Natural enemies play only a small part in the control of the scale in Algeria, the only predator hitherto observed being the Coccinellid, *Chilocorus bipustulatus*, L., which shows a preference for *Aspidiotus hederae*, Vallot, while the only parasite found there is the Chalcid, *Aphelinus chrysomphali*, Mercet, which primarily attacks *Chrysomphalus dictyospermi*, Morg.

The results of four years' experiments with various insecticides are discussed. Fumigation with hydrocyanic acid is the only successful method of treatment hitherto discovered, the best results having been secured with a dose of 7 gms. of potassium cyanide to the cubic metre and an exposure of 45 minutes.

EVANS (J. A.). **O algodão em Moçambique. Cotton in Mozambique.**—4to, 44 pp., 5 charts. Lorenzo Marques, Direc. Serv. Agric., Moçambique, 1928. (In Portuguese and English.)

Cotton in Mozambique is attacked by *Heliothis* (*Chloridea*) *obsoleta*, F., *Earias*, and *Diparopsis castanea*, Hmps., the last named being so far the most injurious. The control measures advised are a close season of 2 or 3 months, with all old cotton destroyed and the land ploughed ; several applications of calcium arsenate dust at intervals of 3–5 days, beginning with the first attack on the young buds ; and hand-picking and destroying infested bolls, especially at the first attack. Cotton stainers [*Dysdercus*], which occur during the latter part of the growing season, transmit boll-rots, which are possibly the greatest single menace to cotton, especially during the rainy season, in Portuguese East Africa. Collection of all old bolls and cotton, a close season of 2–3 months, and hand-picking of the stainers are the methods advised. No successful measure has been worked out against Jassids, which do considerable harm in low-lying areas. A boring weevil, *Apion* sp., is sometimes a very serious pest in the Quilimane district, injuring or killing the stalk or its fruiting branches. The only measure is ratooning the cotton and burning the old stalks as soon as dry.

Gibson (A.). **Insects of the Flower Garden and their Control.**—*Bull. Dept. Agric. Canada*, N.S. no. 99 (Ent. Bull. no. 29), 56 pp., 78 figs. Ottawa, May 1928.

The greater part of this bulletin deals with insect pests of horticulture in Canada ; brief descriptions of the species, the damage they do, and methods of control are given. A few notes on beneficial insects are included, with advice on cultural practices for the control of pests and on the use of insecticides.

Fisk (G. H.). **Insects found under Burlap Bands.**—*Canad. Ent.*, lx, no. 8, pp. 183–184. Orillia, Ont., August 1928.

Numerous insects were found under burlap bands used against the gipsy moth [*Porthetria dispar*, L.] in Quebec, and a list of 52 species, exclusive of Lepidoptera, is given.

de Ong (E. R.). **Progress Report on the Use of Petroleum Oil as an insecticidal Spray.**—*J. Econ. Ent.*, xxi, no. 4, pp. 525–529, 4 refs. Geneva, N.Y., August 1928.

This summary of established field practices in the use of petroleum oil sprays, which includes data covering the species of insects and mites concerned and the dosages used in each case, indicates that while dormant spraying of deciduous trees, owing to the better physical condition of the trees and the more suitable type of oil used, has been almost free from injury, spraying of *Citrus* is still accompanied by functional disturbances, partly due to the employment of oils of too low volatility. Typical analyses of two foliage types of oil are given to illustrate the value of the sulphonation test [*R.A.E.*, A, xiv, 645] and volatility as determined by evaporation in indicating the margin of safety to the plant. The oxidation rate as a means of measuring the stability of oil is another factor that is receiving increased attention. The incorporation of nicotine or other active insecticides directly into the oil before emulsifying offers the possibility of increasing the toxicity of the oil itself without increasing the danger to the plant.

Woglum (R. S.). **The Use of Oil Sprays on Citrus during 1926.**—*J. Econ. Ent.*, xxi, no. 4, pp. 530–531. Geneva, N.Y., August 1928.

Satisfactory control of Coccids on *Citrus* was secured with certain highly refined oil sprays, which were extensively used in California in 1926. Some of these oils, giving a more lasting film, require several weeks before their full effect can be determined, while others, less lasting, but apparently more penetrating or with more toxic properties, kill the scale within a few days. The smothering type of oil coating caused reduction in blossoming, and other injurious influences, such as retarded colouration, reduced crop and impaired quality, were also observed. Injury of this type may be reduced to a minimum by avoiding cold-weather spraying and paying particular attention to the time of picking and strength of spray used [*R.A.E.*, A, xv, 603]. A higher mortality was obtained with some sprays on glossy surfaces, such as fruit and leaves, than on the wood. The best results in the control of the red scale [*Chrysomphalus aurantii*, Mask.] were secured with an oil spray followed by fumigation a few days later, a 98 per cent. kill being secured in all but one of 50 orchards treated, only two of which showed serious fumigation injury. Applications made in August and September gave more lasting results than those made in July. Control of varying duration, lasting in some cases for about a year, was obtained with oil sprays against red spider [*Tetranychus citri*, McGregor].

SWAIN (A. F.) & DUGGAN (C. E.). **Significance of Mid-season Units Counts on resistant Black Scale.**—*J. Econ. Ent.*, xxi, no. 4, pp. 532–542, 5 figs., 1 ref. Geneva, N.Y., August 1928.

Observations on the strain of *Saissetia oleae*, Bern. (black scale) that is resistant to fumigation have been carried out during the 1926–27 season in the *Citrus* belt of southern California in which the unit system for determining scale infestation, hitherto only applied to mature scale in the spring, was used to secure data in regard to the degree of infestation of immature scale. A twig 6–10 in. in length and bearing 8–12 leaves was chosen from each tree in the two diagonals through the orchard. These investigations, which were begun in October 1926 and continued until the scale was mature in May 1927, indicated that while as a rule neither precipitation, temperature, winds nor parasites had any unusual effect upon the rate of mortality, excessively high temperatures caused high mortality among newly hatched larvae in early summer, and one parasite, *Aphycus luteolus*, Timb., was found to be of considerable importance in killing the immature scale. The greatest mortality was observed to follow the greatest period of migration in March and April, when about 50 per cent. of the insects migrate. Off-hatch scale, resulting largely from inefficient spraying, affected the counts made before October and possibly some groves after this period. Their presence can be detected and discrepancies avoided by careful examination of the tops of the trees, where spraying has been less thorough.

The data secured indicate that orchards where counts made before October show less than 5 scale to the unit will become by natural causes commercially clean by the maturity of the scale in June (*i.e.*, showing an average of not more than 1·5 mature scale to the unit).

SEVERIN (H. H. P.) & HENDERSON (C. F.). **Beet Leafhopper,** *Eutettix tenellus* **(Baker), does not occur in the Argentine Republic.**—*J. Econ. Ent.*, xxi, no. 4, pp. 542–544, 3 refs. Geneva, N.Y., August 1928.

Investigations in Argentina from November 1926 to June 1927 failed to reveal the presence of *Eutettix tenella*, Baker, in any of the localities in which it was stated to occur by Boncquet [*R.A.E.*, A, xi, 558], nor was a single specimen found in museum collections. An undetermined species of *Eutettix* was, however, collected on sugar-beet, garden beet and Swiss chard in every locality but one in which Boncquet reported the occurrence of *E. tenella*, with the specific characters of which he was admittedly unacquainted. Boncquet explains the possibility that the specimen identified for him as *E. tenella* did not in fact originate from Argentina. Further experiments to determine the insect vector of curly-top of sugar-beet in Argentina have already been noticed [*R.A.E.*, A, xv, 458 ; xvi, 575].

Hinds (W. E.). **Important Cotton Insects of Central Peru.**—*J. Econ. Ent.*, xxi, no. 4, pp. 545–551. Geneva, N.Y., August 1928.

A brief investigation of the more important cotton pests in a district about 100 miles south of Lima in central Peru afforded no evidence of the existence there of either *Anthonomus grandis*, Boh., or *Platyedra* (*Pectinophora*) *gossypiella*, Saund. *Anthonomus vestitus*, Boh. [*R.A.E.*, A, xv, 597] was found from sea level to an altitude of over 2,000 ft. The presence of the adults is betrayed by the flaring and falling of the squares, which drop more quickly after oviposition than do those attacked by *A. grandis*. Larvae and pupae in fallen squares appear to be resistant to heat and drought, but there is no evidence at present that the species can survive frost during hibernation.

The most serious pest of cotton in Peru appears to be *Anomis pasta*, Guen. A leaf-eating Lepidopterous larva has been locally identified as *A. luridula*, Guen., and it is possible that both species occur. *Alabama argillacea*, Hb., has also been reported as occurring in northern Peru. *A. pasta* appears to be a native moth, and it occurs abundantly every year, the attack being concentrated chiefly on late-planted tender cotton. The life-history resembles that of *A. argillacea*; the egg, larval and pupal stages last 3–5, 12–15, and 7–10 days, respectively, there being at least four generations a year. Multiplication is rapid in spite of the presence of various predators and parasites. Three applications of lead or calcium arsenate sprays are made each season, but the labour employed is very inefficient. Dusting has lately given better results, with economy in time and labour, and aeroplane dusting has been started with every prospect of success, owing to the favourable climatic and topographical conditions.

Several species of boll-boring Lepidopterous larvae, one of which appeared to be *Pyroderces rileyi*, Wlsm., in association with boll rots, accounted for the destruction of 20–25 per cent. of the crop, while heavy infestations by Aphids was reported earlier in the season when the squares were beginning to form, causing dwarfing of the plants.

Bissel (T. L.), U.S. Bur. Ent. **An interesting Aphid of the Pecan.**—*J. Econ. Ent.*, xxi, no. 4, pp. 551–553, 1 pl., 4 refs. Geneva, N.Y., August 1928.

Myzocallis fumipennellus, Fitch, a pest of economic importance in several sections of the pecan belt, caused injury to foliage in pecan orchards of southern Georgia in 1926 and 1927. The distribution of this Aphid is discussed, and a description of it is given. It is usually found on the lower surfaces of the leaves, occasionally on the upper surfaces and rarely on the nuts, hardened leaves being preferred for feeding. A yellow spot which turns brown occurs around the puncture of the nymph; it finally causes the leaf to curl, defoliation resulting from heavy infestation. The nuts are not directly injured, but the growth of the tree is probably checked by the reduction of active leaf surface, involving a decrease in nut production. In 1925, when the temperature was above the average and precipitation low, no general infestation was seen until the end of July, but by the end of August the trees were brown, and defoliation became marked in September. Less defoliation occurred in 1926 when the rainfall was well above the normal and temperatures were a little below it.

Isely (D.). **The Relation of Leaf Color and Leaf Size to Boll Weevil Infestation.**—*J. Econ. Ent.*, xxi, no. 4, pp. 553–559, 3 refs. Geneva, N.Y., August 1928.

Field experiments in 1925 and 1926 indicate a marked preference on the part of the boll weevil [*Anthonomus grandis*, Boh.] for green foliage as compared with red. No economic importance can at present be attached, however, to the apparent immunity of red-leafed cotton, as there is no red-leafed variety that can yet be recommended for commercial planting. Negative results were secured in experiments to determine any preference shown by *A. grandis* between large and small leafed varieties, this character having hitherto been taken into consideration by some plant breeders. Provided the size and vigour of the plants was about equal, no apparent choice was shown between different leaf sizes.

Hinds (W. E.). **Is there any definite Basis for forecasting Insect Outbreaks and ascertaining if Control Measures are practicable? A Discussion from a Research Standpoint.**—*J. Econ. Ent.*, xxi, no. 4, pp. 559–563. Geneva, N.Y., August 1928.

This paper discusses the factors to be considered in attempting to forecast insect outbreaks. Where extended life-history studies have been made of a particular species, it is possible to anticipate to some degree its prospective abundance at the beginning of the following season, but the influence of climatic conditions, parasites, etc., render it impossible to make an accurate forecast at the beginning of the growing season of its final abundance and the extent of damage to any particular crop. The relative size of the autumn population, conditions affecting hibernation, abundance of food-plants, earliness of spring activity, summer temperature and extent and types of rainfall, and the rate of multiplication and number of generations, must all be taken into account in respect of each species, some of which may be susceptible to fairly accurate forecasts, while others present difficulties that cannot be overcome.

Cory (E. N.). **Regional Cooperation in Extension Entomology.**—*J. Econ. Ent.*, xxi, no. 4, pp. 563–564. Geneva, N.Y., August 1928.

An appeal is made for greater co-operation in entomological research and for the rapid building up of a body of control recommendations that are identical for regions where insect activities are comparable. An instance is given in respect of the Mexican bean beetle [*Epilachna corrupta*, Muls.] against which varying control recommendations are at present in force in eleven different States.

Stear (J. R.). **Some Results with Bait Pans against the Oriental Moth,** *L. molesta*, **Busck.**—*J. Econ. Ent.*, xxi, no. 4, pp. 565–571. Geneva, N.Y., August 1928.

The following is the author's abstract of this paper on baits for *Cydia* (*Laspeyresia*) *molesta*, Busck: Bait pan experiments over a two-year period failed to give appreciable control. Tests with various methods of placing bait pans showed that while a pan in every tree gave the highest catch, a pan in every second tree caught almost as many. Variation in the intervals of cleaning and adding molasses to the bait pans showed that a daily removal of insects and frequent additions of molasses resulted in the highest catch of adults. Releases of marked adults in the bait pan plot showed a small percentage of recovery in the pans, the highest being 30 per cent. caught over a period of nine days after release.

From the data on control and the small percentage of released adults recovered, it is concluded that bait pans offer little hope in practical control.

SMITH (R. H.). **An Investigation of Spray Coverages and Arsenical Residue in Relation to the Control of the Codling Moth.**—*J. Econ. Ent.*, xxi, no. 4, pp. 571–588, 1 pl., 2 figs., 40 refs. Geneva, N.Y., August 1928.

This investigation of laboratory studies and orchard experiments in the control of the codling moth [*Cydia pomonella*, L.] carried out during the years 1920–1927, some of which have already been noticed [*R.A.E.*, A, xvi, 90, etc.], indicates that certain conceptions long held concerning spraying with arsenical compounds are partly or wholly erroneous. The factors studied include the character of the spray covering ; its thickness as revealed by the average amount of arsenic to the square centimetre of apple surface ; thoroughness of spray application and completeness of covering as revealed by the quantity of spray applied to the cubic yard of tree volume ; the weathering off of the poison as revealed by repeated analyses during the season ; the entrance habits of newly hatched larvae ; and excessive arsenical residue on the fruit at harvest. An important feature of the investigation was the effort made to eliminate factors that might contribute to experimental error. The results of the investigation indicate, among other things, that the mist covering is decidedly the least protective ; that the protectiveness of any type of covering varies directly with the amount of arsenic to the square centimetre of fruit surface ; that overspraying of trees and the use of more lead arsenate than has been recommended are advisable if the maximum effectiveness of the spray is desired ; that the completeness of covering and amount of arsenic on the fruit vary directly, within certain limits, with the quantity of spray applied to the cubic yard of tree volume ; that many of the larvae enter the apples unharmed or produce serious injury to the fruit by burrowing directly through the deposit of lead arsenate ; and that the efficacy of arsenical sprays in protecting apples against *C. pomonella* has been generally over-estimated.

GINSBURG (J. M.). **A Comparison between complete and incomplete Digestion of sprayed Apple Foliage in determining Arsenic by the Gutzeit Method.**—*J. Econ. Ent.*, xxi, no. 4, pp. 588–592, 2 refs. Geneva, N.Y., August 1928.

This paper describes the testing of two methods of digesting sprayed apple foliage for arsenical analysis. In the first the finely pulverised plant tissue was subjected to complete digestion with concentrated nitric and sulphuric acids until all organic matter was in solution. In the second the plant material was boiled with either 10 per cent. nitric acid or with 20 per cent. hydrochloric acid for about 30 minutes, filtered and washed. Chemical analyses have shown that the amounts of arsenic trioxide recovered from the thus partly digested plant material were practically the same as those recovered from the completely digested material, while the method proved more rapid and less costly.

WHITCOMB (W. D.). **An Experiment in trapping Cutworms.**—*J. Econ. Ent.*, xxi, no. 4, pp. 592–598, 3 figs. Geneva, N.Y., August 1928.

Three experiments carried out in Massachusetts between 27th April and 17th July 1927, in which chickweed sods and shallow screen-bottomed trays baited with chickweed used as traps were examined at 2 and 3 day intervals, resulted in a collection of nearly 8,000 cutworms. The species were determined from moths reared in the laboratory from the cutworms collected, which had been divided into four groups. The largest of these, which contained 94·34 per cent. of all the larvae collected, included *Euxoa ochrogaster*, Gn., *E. tessellata*, Harr., and *E. perpolita*, Morr. *Agrotis fennica*, Tausch., and *A. unicolor*, Wlk., were trapped in noticeable numbers, and other species reared included *Feltia subgothica*, Haw., *Noctua smithi*, Snell., *Polia* (*Mamestra*) *renigera*, Steph., *Sidemia* (*Hadena*) *devastatrix*, Brace, *Noctua bicarnea*, Guen., and *Lycophotia margaritosa* var. *saucia*, Hb. Rain and cold cloudy weather noticeably decreased the numbers of cutworms collected, while temperature variations had a less noticeable influence. The results of these studies indicate that traps may be used to determine the time and degree of abundance of different cutworms and the date of application of control measures.

GRADY (A. G.). **Studies in breeding Insects throughout the Year for Insecticide Tests.**—*J. Econ. Ent.*, xxi, no. 4, pp. 598–612, 1 fig., 3 refs. Geneva, N.Y., August 1928.

This series of studies on the breeding of various insects for insecticide tests includes a paper on *Dermestes vulpinus*, F. (leather beetle) and another on cockroaches, *Tineola bisselliella*, Humm., and various beetles that infest stored products.

Dermestes vulpinus, which can be reared simply and dependably throughout the year, has been used with very good results for certain kinds of insecticide experiments. A short account is given of the biology of this beetle, which is of little economic importance, and the technique employed in the rearing experiments is described. Tests carried out in 1926 showed it to be more resistant to various contact sprays than any of the other insects used, which included *Blattella germanica*, L. *Popillia japonica*, Newm., *Leptinotarsa decemlineata*, Say, and *Periplaneta americana*, L., and this renders it of use in measuring the efficiency of certain toxic compounds.

Insects that were easily reared in large numbers for the purpose of biological experiments included *Blattella germanica*, L., which was bred in a simple rearing cage ; *Tineola bisselliella*, Hummel (webbing clothes moth), which was reared in small containers in the insectary ; and *Bruchus obtectus*, Say, *B. pisorum*, L., *Calandra* (*Sitophilus*) *oryzae*, L., and *Tribolium confusum*, F., which were reared in large tin drums. The methods employed in rearing these insects are described in each case. At a temperature of 77° F. *B. germanica* will develop from egg to adult in about 5½ months and *T. bisselliella* in a little over 3 months. The temperature within the drums in which the beetles were reared, although kept in an outer insectary where the temperature averaged 64·4° F., sometimes rose as high as 95° F.

PEET (C. H.) & GRADY (A. G.). **Studies in Insecticidal Activity.**—*J. Econ. Ent.*, xxi, no. 4, pp. 612–625, 7 refs. Geneva, N.Y., August 1928.

This series of studies includes papers on direct contact sprays, fumigants and repellents or moth-killers.

A description is given of a standardised method for testing contact sprays in the form in which they would be applied against household pests, *viz.*, in oil solution and in a strictly inert carrier. An equation has been developed that expresses the effectiveness of the insecticide mathematically. For the testing of insecticides in powder form a special method is outlined.

An exact procedure is described for the testing of fumigants in storage warehouses, in which boxes containing cultures of moths and larvae placed between woollen material are placed in a chamber not less than 200 cu. ft. in capacity, the temperature being maintained at about 80° F. The respective methods of applying gaseous and volatile liquid fumigants are outlined. At the end of the test period of 24 hours the box of wool is removed and the minimum concentration of the fumigant that will give 100 per cent. mortality is determined. This value, which is called the fumigation factor, is never based upon less than two tests. To test the value of grain fumigants a small sack, filled with grain and containing about 100 beetles, is placed in a basket filled with grain and covered to a depth of 6 inches. Four of these baskets are exposed to the fumigant in the fumigating vault during 24 hours at a temperature of 80° F., the fumigation factor being determined on the basis of two tests. A slight variation of this method is outlined for the testing of fumigants in the case of milled grain.

A detailed description is given of the procedure followed in testing the effectiveness of repellents (proofers) and insecticides against clothes moths.

WALTHER (E.). **Some additional Notes on the Pine-needle Mite,** *Eriophyes pini*, **Nalepa.**—*J. Econ. Ent.*, xxi, no. 4, pp. 628–631. Geneva, N.Y., August 1928.

Further information in regard to *Eriophyes pini*, Nal. (pine needle mite), published in view of the growing importance of *Pinus radiata* (Monterey pine) throughout the natural range of which it occurs and which it principally attacks, includes a revised list of food-plants [*R.A.E.*, A, xiv, 78], which now include *P. echinata* in Ohio and North Carolina, *P. sylvestris*, *P. laricio* and *P. cembra* in Central Europe, and *P. attenuata*, *P. ponderosa*, *P. pinea*, and *P. canariensis* in California. The mites do not appear to hibernate within the buds, but may be found at all times, dormant or active, within the basal sheaths of the needle clusters, except where the winters are very cold. The galls reported to be made by this mite in Europe and parts of the United

States may represent its reaction to a more severe climate. It appears to be widely distributed and seems to be carried over short distances by the wind, while its sudden appearance in new localities may probably be accounted for by the transport of cut branches and young trees.

Spraying with a 6·66 per cent. lubricating oil emulsion has been fairly successful on a small scale, but careful reafforestation seems to promise the only permanent cure. Only uninfested young pines should be planted after removal of all infested trees, and the rigid enforcement of quarantine measures seems essential for the checking of any further spread of the mite. In incomplete tests carried out in 1927 the best results were secured from oil spraying by early application before the new growth becomes infested. While the effects of 6·66 per cent. oil spray are lasting, the oil film remaining visible and actively protective for a long time, injury to the pines is likely to result from the heavy concentration, and it is possible that several applications of lighter emulsions might prove more satisfactory.

McIndoo (N. E.), U.S. Bur. Ent. **Tropic Responses of Codling-moth Larvae.**—*J. Econ. Ent.*, xxi, no. 4, p. 631. Geneva, N.Y., August 1928.

This paper, of which only an abstract is given, deals with the tropisms of the larvae of the codling moth [*Cydia pomonella*, L.]. Experiments are described indicating that smell and sight aid the larvae of the first instar, which are weakly photopositive in bright light, in finding food. The larvae were found to be easily repelled and attracted with difficulty. Larvae of the second, third and fourth instars are weakly photopositive to dim light, but indifferent to strong light, while larvae of the fifth instar sometimes act indifferently to light, but are generally weakly photonegative. Larvae of the sixth instar are either weakly or strongly photonegative according to their age. When the cocoons are being formed, the larvae are strongly photonegative, geopositive and thigmopositive, and consequently avoid bright light, usually move downwards, and hunt for dark and tight places in which to pupate.

Crowell (M. F.). **A Vial for catching small leaping Insects.**—*J. Econ. Ent.*, xxi, no. 4, pp. 632–633, 1 fig. Geneva, N.Y., August 1928.

A description is given of a cone of fine wire screen with an opening at the apex, which when fitted into the open end of a vial will prevent the escape from it of leaping insects, such as *Erythroneura comes*, Say, thus facilitating their collection.

Smith (C. E.) & Allen (N.). **Sexual Color Variation in *Heliothis obsoleta*, Fab.**—*J. Econ. Ent.*, xxi, no. 4, p. 633. Geneva, N.Y., August 1928.

Colour variations hitherto treated as varietal characters of *Heliothis obsoleta*, F., are considered to be probably specific sexual characters. Numerous dissection records and oviposition observations made in

Louisiana in the autumn of 1926 and 1927 showed all individuals formerly considered as belonging to the variety *ochracea*, Ckll., to be females, while all those of the variety *umbrosa*, Grote, were males.

PORTER (B. A.) & SAZAMA (R. F.). **A new Method of using Fish-oil as an Adhesive.**—*J. Econ. Ent.*, xxi, no. 4, pp. 633-634. Geneva, N.Y., August 1928.

In a recently developed adaptation of the use of fish oil as an adhesive for use in spraying with lead arsenate for the gipsy moth [*Porthetria dispar*, L.] the oil was poured directly into the spray tank [*R.A.E.*, A, xv, 289]. A more intimate mixture is obtained by making a paste, as the lead arsenate emulsifies the oil. The proportions used are 8 lb. lead arsenate, 14 lb. water and 2 lb. fish oil. The lead arsenate and water are first thoroughly mixed, the fish oil is then added and the whole pumped two or three times, thus constituting a very stable emulsion containing approximately 33 per cent. lead arsenate by weight. As an analysis of the paste showed only 0·18 per cent. of water-soluble arsenic based on the quantity of lead arsenate in the mixture, it appears that little or no arsenic is made water-soluble in this process, and preliminary observations indicate that the emulsion has very good adhesive properties.

Similar mixtures of fish oil with barium fluosilicate, potassium fluosilicate and cryolite have also been successfully prepared, although these materials make a somewhat flocculent mixture and are rather difficult to pump. The addition of a casein-lime spreader, ½ oz. to each lb. of insecticide, appears to result in a smoother paste. Thorough stirring is necessary before measuring out the paste materials into the tank, since the solid matter tends to settle while standing.

SULLIVAN (K. C.). **Three Years of Dust Spraying under Missouri Conditions.**—*Bull. Missouri Agric. Expt. Sta.*, no. 259, 12 pp. Columbia, Mo., April 1928.

The results of dusting experiments on apples carried out in Missouri during 1925, 1926 and 1927 are discussed. The following is largely taken from the author's conclusions: A home-mixed sulphur dust containing 90 lb. sulphur and 10 lb. lead arsenate gave satisfactory results against apple pests [the insects concerned being *Cydia pomonella* and *Tachypterellus quadrigibbus*] and seemed as efficient as one containing 85 lb. sulphur and 15 lb. lead arsenate. Two pounds of the dust per tree seemed as effective as 5 lb. per tree. Dusts cover the foliage and fruit more evenly than sprays, but do not remain on them so long, and it is therefore necessary to make almost twice as many applications. Dust materials are rather more expensive than spray materials, but require less labour and are easier to apply. Also dusting machines are light and can be used on heavy ground and steep hills. Dusts may be used with advantage to supplement sprays when a rapid application is necessary. Also by using them for late summer applications arsenical residue is largely eliminated. The time of application of the primary sprays against *Cydia pomonella* should be based on emergence records of the adults, and the maintenance of breeding cages in the orchard is therefore important.

PORTER (B. A.), CHANDLER (S. C.) & SAZAMA (R. F.). **Some Causes of Cat-facing in Peaches.**—*Bull. Illinois Nat. Hist. Surv.*, xvii, art. 6, pp. 261–275, 10 figs., 7 refs. Urbana, Ill., March 1928.

The following is taken from the authors' summary : Peach cat-facing is a scarred and distorted condition of the fruit, which causes serious losses in some seasons in the peach-growing sections of the Middle West and elsewhere. The investigations recorded prove that at least six species of insects play a part in the production of cat-facing. These are *Lygus pratensis*, L. (tarnished plant bug), *Conotrachelus nenuphar*, Hbst. (plum curculio) and the Pentatomids, *Euschistus variolarius*, P. de B., *E. euschistoides*, Voll., *E. servus*, Say, and *E. tristigmus*, Say. *C. nenuphar* goes through its life-cycle on peach and other fruits. The other insects breed on a wide variety of plants and feed on the peach fruit for only a short time in spring.

No method of complete control of *Lygus* and *Euschistus* is available. These bugs are very active and are resistant to the most powerful contact insecticides known. Proper adjustment of cultural practices, to avoid the growth of weeds and certain crops in the orchard or in neighbouring fields, seems to offer promise of partial control. Reduction in cat-facing caused by *C. nenuphar* may be accomplished by following the recommended control measures, mainly by spraying or dusting and cultivation.

FLEURY (A. C.). **Report of Pest Interceptions at California Plant Quarantine Inspection Points for 1927.**—*Spec. Pub. California Dept. Agric.*, no. 84, 29 pp. Sacramento, Cal., 1928.

A list is given of the pests intercepted at the maritime ports and border highway stations of California during 1927, showing wherever possible the food-plants on which they were found and the country of origin. The importation of fruit from areas where *Ceratitis capitata*, Wied., is a pest is prohibited, but infested fruit was found in passengers' luggage and ship's stores. Adult fruit-flies were intercepted for the first time in a box containing Kamani nuts from Hawaii ; they had evidently emerged *en route*. *Stenoma catenifer*, Wlsm., a serious pest of avocados, was taken in avocado seed from the Canal Zone, and *Prays citri*, Mill., in an orange from Guam. Neither of these moths is known to occur in the United States. The larvae of *P. citri* live just beneath the rind (next to but not in the pulp) and form gall-like tumours that remain open at the tips, destroying the appearance and keeping qualities of the fruit and rendering them susceptible to destructive fungi.

COMPTON (M. E.). **Fighting Bugs with Electricity.**—*Better Fruit*, xxiii, no. 3, pp. 12–13, 2 figs. Portland, Ore., September 1928.

Experiments consisting of a series of radio treatments to orchards are being carried out in Washington State. Electricity under high voltages and at high frequencies is emitted for a certain period every day through a network of wires suitably placed over the trees. Chemical reaction in the atmosphere occurs in the neighbourhood of the wires ; this has proved very beneficial to the crops, and trees treated daily for half an hour have been cleaned of Aphids and scale-insects. Insects have also been killed by this method in greenhouses.

Crawford (R. F.) & Eyer (J. E.). **The Giant Apple Root Borer.**—*Bull. New Mexico Agric. Expt. Sta.*, no. 168, 8 pp., 5 figs. State College, N.M., May 1928.

Prionus californicus, Mots., the stages of which are described, is a pest of fruit trees in New Mexico and is particularly injurious to apple. The life-cycle occupies 3 years ; pupation occurs in the latter part of May, and the adult beetles emerge in early June, oviposition taking place soon afterwards. Tunnels, frequently 2 ins. broad, are cut by the larvae in the living wood of the roots and sometimes in the bark and heartwood of the crown. The tree, which may be girdled, dies during the second or third year following a bad attack. Orchards on light sandy soil suffer more than those on heavier soils, single trees sometimes containing as many as 15–20 borers.

From 2 to 4 oz. of paradichlorobenzene when placed in spring around each of the infested trees, 5 or 6 ins. from the bark, killed an average of 50 per cent. of the insects after 3 months without injuring the trees. The poison would be best applied in early June, since very young larvae proved to be more susceptible.

Quayle (H. J.). **Fumigation with Calcium Cyanide Dust.**—*Hilgardia*, iii, no. 8, pp. 207–232, 12 figs., 21 refs. Berkeley, Cal., April 1928.

In this discussion of the use of calcium cyanide for fumigating *Citrus*, two forms, designated " A " and " C," are described. The former is made by fusing calcium cyanamid with sodium chloride and contains from 27 to 30 per cent. HCN. This fumigant was abandoned in 1924 because it injured the trees. The " C " form was first used in California in 1925, and is the " citrofume " discussed in a recent paper [*R.A.E.*, A, xv, 263]. Comparisons of dosage between " C " calcium cyanide and liquid HCN are given, and the method of determining mean concentrations of gas is explained. It was found that it was not necessary to have as much HCN in the dust as in the liquid to obtain the same effect on Coccids, and a study of the gas concentration under the tent showed that the same concentration occurred under the tent when less actual HCN was put under with the dust than with the liquid. Less gas must therefore have escaped through the tent in one case than in the other. When fumigation is conducted in an enclosure that does not permit any leakage, this differential in favour of the dust does not appear. The data given indicate that 1¼ oz. of " C " calcium cyanide dust is equivalent to 20 cc. of liquid HCN., and there is approximately 25 per cent. less HCN in this amount of the dust than there is in 20 cc. of the liquid. The evolution of gas from " C " calcium cyanide was not greatly retarded when the relative humidity was as low as 20 to 22 per cent., but this humidity did considerably retard the evolution of gas from " A " cyanide. The evolution of gas from both " A " and " C " seemed to be independent of temperature within ordinary fumigation limits, that is, between 40 and 80° F.

Dozier (H. L.). **Two new Aleyrodid (Citrus) Pests from India and the South Pacific.**—*J. Agric. Res.*, xxxvi, no. 12, pp. 1001–1005, 5 figs. Washington, D.C., 15th June 1928.

Descriptions are given of the pupa cases of *Dialeurodes* (*Dialeurolonga*) *elongata*, subgen. et sp. n., from *Citrus* in Punjab, and *Aleuroplatus samoanus*, Laing [*R.A.E.*, A, xvi, 3] from citron (*Citrus medica*) in the Marquesas Islands.

GINSBURG (J. M.). **An Apparatus for obtaining measured Areas of sprayed Foliage for Chemical Analyses.**—*J. Agric. Res.*, xxxvi, no. 12, pp. 1007–1009, 1 fig., 2 refs. Washington, D.C., 15th June 1928.

A steel punch for cutting uniform circular areas out of leaves at the time the latter are gathered is described. Different cutters enable the size of area to be varied, and a recorder automatically registers the numbers of cuts made. Analyses of leaves collected during August and September from apple trees that were sprayed earlier in the summer with a mixture of sulphur, lead arsenate and ferric oxide showed that the amount of arsenic and sulphur trioxide on the cut surfaces fairly represent the proportion of that on the entire leaves.

SEVERIN (H. H. P.). **Transmission of Tomato Yellows, or Curly Top of the Sugar Beet, by** *Eutettix tenellus* **(Baker).**—*Hilgardia*, iii, no. 10, pp. 251–271, 2 pls., 8 figs., 23 refs. Berkeley, Cal., May 1928.

Experiments are described that prove that the beet leafhopper, *Eutettix tenella*, Baker, transmits tomato yellows disease or curly-top to tomatos [*cf. R.A.E.*, A, xv, 282, 537]. Tomatos inoculated with the curly-top virus from sugar-beets by means of infective leafhoppers developed typical symptoms of the yellows disease under field conditions. Non-infective leafhoppers after feeding on infected tomatos were transferred to healthy sugar-beets, and typical symptoms of curly-top were produced. The disease was also transmitted from tomatos naturally infected with yellows disease to sugar-beets. A study has been made of the spring migrations of *E. tenella* with a view to safe planting of tomatos. In the Sacramento Valley in 1927 the maximum flights occurred on 4th and 12th of May, no increase in numbers taking place after 12th May, and after these large flights the adults dispersed on all green vegetation. Tomato planting should therefore be tried after the migratory flights cease; the late-planting schedule for sugar-beets might be followed with advantage. It is possible, however, that the second generation, which acquires wings in July, may invade the tomato fields, but good crops have been obtained in the interval between the two generations.

The longevity of the leafhoppers on tomatos varied according to the age of the plant, the adult life of males being shorter than that of females.

BOX (H. E.). **Proyecto para la introducción de parásitos tucumanos a Luisiana (E.E. U.U. de N.A.).** [A Project for the Introduction into Louisiana of the Tucumán Parasites of *Diatraea saccharalis*.]—*Rev. ind. agric. Tucumán*, xviii, no. 11–12, pp. 209–213. Tucumán, 1928.

This article reprints a letter sent by the author to the American Sugar Cane League at New Orleans urging that the parasites of *Diatraea saccharalis* occurring in Argentina [*R.A.E.*, A, xvi, 159] be introduced into Louisiana. The importation of these parasites has now been decided upon.

PICKEL (B.). **Duas pragas do tomateiro** (*Solanum lycopersicum* **L.**). [Two Pests of Tomato.]—*Chacaras e Quintaes*, xxxviii, no. 2, pp. 145–147, 3 figs. S. Paulo, 15th August 1928.

The Tingid, *Corythaica monacha*, Stål, and the mite, *Tetranychus bimaculatus*, Harvey, which were found associated on tomato plants in the State of Rio de Janeiro, had been very destructive, especially the former. The tips of the branches were dead, or the leaves were rotted along stems loaded with fruits. As it was too late to save the plants, the whole plantation was burnt. In Brazil *C. monacha* occurs on a number of species of *Solanum*. A quassia-soap spray is very efficient against it, and attention is drawn to the fact that *Quassia amara* grows extensively in Brazil.

OGILVIE (L.). **Report of the Plant Pathologist for the Year 1927.**—*Rep. Dept. Agric. Bermuda 1927*, pp. 26–37. Hamilton, 1928.

Calpodes ethlius, Cram., severely damaged arrowroot plants in St. David's Island in March 1928. It is suggested that this skipper could be eliminated by destroying all the old arrowroot plants and those of *Canna indica*. *Cicadula sexnotata*, Fall., the carrier of aster yellows, has been newly observed on *Senecio jacobaea*, *Chrysanthemum maximum* and some weeds, being also extremely plentiful on *Calendula officinalis*, lettuce (in several plots of which over 20 per cent. of the plants were infected) and carrots. Though found in isolated fields of lilies, this leafhopper is not apparently associated with any of their virus diseases. Aster yellows could not be experimentally transmitted by *Empoasca fabae*, Harr., *Anuraphis tulipae*, Boy., or *Macrosiphum gei*, Koch. A condition much resembling mosaic disease on the leaves of Chinese banana (*Musa cavendishi*) was noticed in November 1927, *Pentalonia nigronervosa*, Coq., being present on the plants.

Severe injury by Sminthurids to Chinese cabbage and *Matthiola incana*, especially its lower leaves, was observed in January 1928, as irregular abrasions that dried as papery areas usually bordered by the leaf veins. Dusting with nicotine in the early morning gave good results. *Ceratitis capitata*, Wied., occurred on a small planting of broad beans; tomatos were not attacked. Eggs and larvae were found in considerable numbers in Chinese bananas that were turning yellow, none being found in the green fruit. Oviposition presumably takes place in partly ripe fruit, the tannins in the skin of which kill many of the larvae. Between June 1927 and the end of January 1928, 78 females and 102 males of *Opius humilis*, Silv., bred from puparia from Hawaii [*R.A.E.*, A, xvi, 229], were liberated.

Thrips spp. and *Pseudococcus citri*, Risso, were present on *Hippeastrum* affected with a mosaic disease that has become increasingly prevalent during recent years. *Aphis gossypii*, Glov., caused severe leaf-fall of *Hibiscus* in hedges throughout the summer. This was checked by spraying with 40 per cent. nicotine sulphate, 1 : 800. Complete proof of the transmission of yellow flat in lilies by *A. gossypii* has been secured. *A.*(?) *sinensis*, Del G., is also found on lilies, *Neotoxoptera violae*, Perg., being rarely present. These Aphids are easily controlled by dusting with nicotine or spraying with nicotine sulphate. *Frankliniella insularis*, Frankl., is a very common pest of the lily blooms. A slight outbreak of *Aulacaspis* (*Diaspis*) *pentagona*, Targ., was controlled by the introduced parasite, *Aphelinus diaspidis*, How.

In one planting, peach shoots were distorted by *Anuraphis persicae-niger*, Smith (black peach aphis). The autumn crop of potato was heavily infested with *Empoasca fabae*, which yearly causes severe hopper-burn. Spraying with Bordeaux mixture is suggested as a repellent. Severe injury to potato by *Phorbia cilicrura*, Rond. (*fuscipes*, Zett.) was observed in November. The formation of its galleries in the bases of the stems resulted in the production above these of small aerial tubers, and later in sudden wilting. Manure should be applied long before planting time, since it is very attractive to the flies. *Aphis maidis*, Fitch, was observed on maize, and *Sipha flava*, Forbes, on sugar-cane and grasses. An embargo was placed on *Sorghum* and sugar-cane in the raw state to prevent the possible introduction of *Pyrausta nubilalis*, Hb. *Aleurodicus cocois*, Curtis, was intercepted on coconut palms from Trinidad.

Simmonds (H. W.). **Entomological Records.**—*Agric. J. Dept. Agric. Fiji*, i, no. 1, p. 7. Suva, 1928.

Miscellaneous pests in Fiji during 1928 were: *Dacus passiflorae*, Coq., bred from cotton bolls, grenadilla buds and papaya; the bug, *Germalus pacificus*, Kirk., large numbers of the nymphs and adults of which were found on the berries of *Lantana*; the Pentatomid, *Coleotichus sordidus*, Wlk., also taken from *Lantana*, but of which the adults only have been found; and *Dysdercus insularis*, Stål, and *Tectocoris lineola*, F., recorded from the fruits of *Stercula* sp.

In one instance an unidentified Chalcid destroyed 15 per cent. of the pupae of *Platyedra gossypiella*, Saund. (pink bollworm).

Simmonds (H. W.). **Stained Cotton in Fiji and its Causes.**—*Agric. J. Dept. Agric. Fiji*, i, no. 1, pp. 10–12. Suva, 1928.

The two chief types of stained cotton in Fiji are the reddish-brown discolouration caused by *Tectocoris lineola*, F. (harlequin bug), which appears to be of a mechanical nature, only being produced when no infection is introduced when the seed is punctured, and the yellow stain, which is far more abundant and is largely distributed by *Dysdercus*. This stain is generally spread over the whole area of the affected section of the boll, does not start at a definite point on the seed, and becomes increasingly abundant with the advance of the season. Experiments were conducted with *D. insularis*, Stål, to test the effects of its attacks on bolls and flower buds. Twelve second instar nymphs were placed in cages over a flowering shoot of cotton on 20th May, and on 14th June about half the flower squares had been shed. No trace of puncture or proliferation was, however, observed, and it is thought that up to the end of the third instar the nymphs are unable to puncture the bolls, but obtain food from the surface layers of the plant and flower squares; the development of the nymphs was very slow in captivity. On 14th June four fifth instar nymphs were placed in two cages, and on 27th June, all but one of the bolls in one cage had fallen off, and this one had been heavily punctured and the seeds were rotting; no staining was, however, present. One boll in the second cage showed typical proliferation; the remaining two, which were left to mature, showed no signs of staining. In a third series of experiments nymphs of the second or third instars did not produce punctures, but after the fourth instar punctures and proliferation were general and rots were introduced in two cases, but no staining was obtained. It has been previously stated [*R.A.E.*, A, xiv, 320] that the yellow stain is due to the introduction of fungus spores by insects that have previously fed on diseased bolls, and the fact that all the stainers used in the experiments had been reared on clean immature cotton would appear to confirm this.

CURRIE (G. A.). **Entomological Hints to Cotton Growers.**—*Queensland Agric. J.*, xxx, pt. 2, pp. 100–102. Brisbane, 1st August 1928.

The control of the corn ear worm [*Heliothis obsoleta*, F.] on cotton in Queensland is discussed. All land where cotton was grown in the previous season should be ploughed in winter to destroy overwintering pupae ; and all fallow land and ratoon crops should be kept free from weeds in September and October so that no food-plants are available for the spring generation of caterpillars. Cotton should be planted as early as possible so that the bushes may have passed the susceptible squaring stage before the caterpillars become very abundant. Natural enemies of the pest, such as birds and predacious wasps (*Polistes*), should be protected and encouraged.

WOODHILL (A. R.). **Spraying for Woolly Aphis. The Addition of Miscible Oil to Summer Tobacco Sprays.**—*Agric. Gaz. N.S.W.*, xxxix, pt. 8, pp. 613–614. Sydney, 1st August 1928.

An experiment carried out in 1927 confirms previous tests and indicates that no advantage is gained by adding small quantities of miscible oil to sprays of tobacco and nicotine sulphate against woolly aphis [*Eriosoma lanigerum*, Hausm.], while if more than 2 pts. per 100 gals. is added, scorching of the apple foliage may result.

NEWMAN (L. J.) & CAHILL (—). **Fruit-fly** (*Ceratitis capitata*). **Baiting and Trapping Experiments.**—*J. Dept. Agric. W. Aust.*, v, no. 2, pp. 229–234, 2 figs. Perth, W.A., June 1928.

Experiments have been carried out to compare the merits of bait-sprays and trapping or luring methods against *Ceratitis capitata*, Wied. Six peach trees were used on which fruit-flies of varying ages were liberated. The foliage spray used on two of them consisted of 2½ oz. lead arsenate powder, 4 lb. molasses, the juice of 12 oranges and water to make 4 gals. With this bait used four times for flies under 10 days old, 12 per cent. of the fruit became infested ; when used for flies over this age, 30 per cent. of fruit became infested. As the spray is thus far more effective if the flies are poisoned before oviposition, it should be applied once every seven days. The substitution of sodium arsenate for lead arsenate in the bait-spray proved impracticable as, even with the lowest strength, the leaves and young wood were injured. The bait-traps used and their effect have been previously described [*R.A.E.*, A, xv, 212, 640] ; their use against flies under 10 days old gave 5 per cent. infested fruit, and against flies ready to oviposit 18 per cent. On the one tree left untreated, 89 per cent. of the fruit was infested.

It is concluded that bait sprays, when used correctly, are effective in control of *C. capitata*. Trapping gives 7 per cent. more sound fruit, but it requires twice as long to tend, clean and renew the bait in the traps. In large areas, however, the extra time and labour would more than counterbalance the 7 per cent. of fruit saved.

NEWMAN (L. J.). **Fruit-fly** (*Ceratitis capitata*). **Trapping or luring Methods.**—*J. Dept. Agric. W. Aust.*, v, no. 2, pp. 246–251, 1 fig. Perth, W.A., June 1928.

A detailed account is given of the bait-trap substances employed against *Ceratitis capitata*, Wied., in Western Australia [see preceding paper] and their relative values. Kerosene was already known to have an attraction for the fly, but captured only males ; many other oils were tested without success. Pollard mixed with water had more attraction for females than any other substance tried, particularly as an incitement to oviposition, but had little influence on the males. Three years' experience has shown that the most successful formula is 8 oz. pollard (bran), 8 oz. powdered borax, $\frac{1}{4}$ oz. sodium arsenate, and water to make one gallon. The sodium arsenate is a corrective against fermentation and also renders the lure poisonous. The flies are immediately attracted to the bait, fly to the edge of the vessel, plunge straight in and are drowned. An average of 88 per cent. of the flies so captured were fertile females. The bait should be renewed every 7 days in summer and every 10 days in winter. There is a rapid falling-off of males as winter advances; after mid-July none was captured until December ; in August the females gradually decrease, but appear again in December. It appears, therefore, that the fly survives the period from May to September in the form of overwintering females, and these are attracted to *Citrus* trees—the only ones bearing fruit during winter and also offering shelter. Under favourable weather conditions, a few eggs may be deposited. The bait-tin recommended is a marginal-edged $\frac{3}{4}$-pint tin containing half a pint of bait. Bright tins should be used and placed about half-way up the tree on the north-east and north-west side, and in proximity to fruit if any is present. From November to March, the tins should be hung in the shade and from April to October in the sun. The minimum number of tins for each tree is two, and trapping should be done whenever the weather is favourable. A few flies captured in winter and spring are far more important than larger numbers later on. In connection with the trapping method, orchard sanitation should be practised co-operatively, all fallen and infested fruit being removed throughout the year.

VAN DER GOOT (P.). **De juiste wijze van *Epilachna*-bestrijding.** [The correct Method of combating *Epilachna*.]—*Korte Meded. Inst. Pl Ziek.*, no. 8, 18 pp. Buitenzorg, 1928. (With a Summary in English.)

The Coccinellid, *Epilachna vigintiduopunctata*, Muls., is the most important pest of potato in Java. It is also common on wild Solanaceae. Serious harm is caused only by larvae of the fourth (last) instar ; but under special conditions, the beetles may become injurious if they are very numerous. Injury by the larvae is to be expected either at the beginning or at the end of the rainy season. In the potato districts, at an altitude of about 4,000 ft., with a temperature of 60–70° F., the life-cycle usually requires 41 days. Hand picking the adults is expensive and ineffective, probably owing to constant re-infestation from outside. It is recommended that the young larvae should be picked by hand when the plants are about 5 weeks old, and the older larvae knocked off 2–3 weeks later. If the beetles occur in large numbers, a spray of 2 per cent. lead arsenate, which acts as a repellent, may be used.

LIGHT (S. S.). **Report of the Entomologist [for 1927].**—*Bull. Tea Res. Inst. Ceylon*, no. 2, pp. 25–34, 1 pl. Kandy, 1928.

Homona coffearia, Nietn. (tea tortrix) has been declared a pest under the Plant Protection Ordinance with the regulation that egg-masses be collected on every tea estate. About 14 per cent. of these from severely infested districts were attacked by a parasite, probably *Trichogramma* sp. As the necessary supply of egg-masses of *H. coffearia* is not always available, experiments have been made in breeding the parasites in the eggs of *Sitotroga cerealella*, Ol. These have been to a certain extent successful, though the normal local temperature is too low for satisfactory breeding of this moth. Information has been received from Buitenzorg to the effect that *H. menciana*, Wlk., a pest of tea in Java, India and Formosa, is identical with *H. coffearia*.

Xyleborus fornicatus, Eichh. (shot-hole borer) is recorded for the first time as infesting tea seed on various estates. In a case under observation from ½ to 1 per cent. of the seed was infested, 50 per cent. of the borings in mature seed passing through or near the radicle so that germination will be considerably affected. In view of the danger of spreading this pest through the medium of the seed, all seeds found to be attacked should be destroyed, or fumigated with carbon bisulphide. Tea seeds have also been attacked by a species of *Coccotrypes*, resembling, but not identical with, *C. pygmaeus*, Eichh.

Brevipalpus obovatus, Donn. (scarlet mite) again caused great damage in tea nurseries. Dusting with sulphur fails to reach the mites under the leaves, and is expensive. Spraying with sulphur and soft soap is recommended for seedlings where the danger of tainting need not be considered, and for mature bushes a spray of kerosene and flour has been used with some success, the kerosene evaporating without affecting the flavour of the tea. *Tarsonemus translucens*, Green (yellow mite) is less injurious but more common than *B. obovatus*. It causes all the leaves to drop from young shoots, but is very susceptible to showers of rain.

Arbela quadrinotata, Wlk., a common pest of *Albizzia*, was recorded from tea, and also a larger borer, possibly the Hepialid, *Phassus purpurascens*, Mo. Picking and burning infested foliage, assisted by crows and the Tachinid parasite, *Exorista heterusiae*, appear to be satisfactory in controlling *Heterusia cingala*, Mo., which was reported from various parts of the tea area, attacking mainly older leaves. Other Lepidoptera attacking tea include the Psychids, *Psyche albipes*, Mo., *P. vitrea*, Hmpsn., *Clania variegata*, Snell., and another species, probably *C. crameri*, Westw., which caused considerable injury to seedlings, and *Chalia doubledayi*, Westw. ; the Lymantriid, *Notolophus posticus*, Walk. ; the Pierid, *Terias silhetana*, Wall. ; the Geometrid, *Boarmia acaciaria*, Boisd. ; the Tortricids, *Adoxophyes privatana*, Wlk., *Tortrix* (*Cacoecia*) *epicyrta*, Meyr., and *Gracilaria theivora*, Wlsm.; and the Noctuid, *Agrotis ypsilon*, Rott., which caused serious injury in many districts. *Pseudococcus lilacinus*, Ckll., was found on the roots of mature bushes. Shoots on recently pruned tea are frequently injured by *Toxoptera aurantii*, Boy., which produces curling and distortion of the leaves. Injury often resembling an attack of the fungus, *Cercosporella theae*, is frequently caused by Capsids, one of the species known to attack the bushes being *Callicratides rama*, Kirby. Other pests observed during 1927 were *Coccus viridis*, Green (green bug), *Saissetia hemisphaerica*, Targ. (brown bug) and *Oscinis theae*, Lef. (leaf miner).

Terias silhetana has become an important pest of *Acrocarpus*. Owing to the attack of this caterpillar on shoots appearing on *Albizzia*, after lopping, in some districts, it may eventually be advisable to make use of some other green manure plant. The females prefer to lay their eggs, which are deposited on the lower surfaces of the leaves, within 10–15 feet of the ground, and where *Albizzia* trees have been allowed to grow up to 40–50 ft. they remain undamaged. *Xyleborus discolor*, Bldf., was recorded for the first time attacking two-year-old plants of *Tephrosia candida*, though apparently avoiding younger ones. It has previously been recorded from *Albizzia, Hevea, Lonicera caprifolia* and *Cassia multijuga*. *Crotalaria saltiana* is attacked by *H. coffearia* and also by a Noctuid, a Pyralid, and a Lycaenid butterfly, all of which infest the pods. *Erythrina lithosperma* (dadap) was attacked by *Suana concolor*, Wlk. (grey dadap caterpillar), *Agathodes ostentalis*, Hb. (dadap borer) and *Astycus immunis*, Wlk., var. *bilineatus*, Mshll., *Derris robusta* by *Xyleborus fornicatus*, Eichh., *Gliricidia maculata* by *Pseudococcus citri*, Risso, *P. virgatus*, Ckll., and *Coccus viridis*, and *Indigofera endecaphylla* by *Dichomeris ianthes*, Meyr. Spraying with Paris green at the rate of 1 oz. to 10 gals. water is recommended for the control of the last-named moth, the larvae of which web themselves up in the leaves where they pupate, and often cause complete defoliation of the plants.

LIGHT (S. S.). **Newly-recorded Food-plants of some Pests of Tea and Green Manures.**—*Tea Quarterly, J. Tea Res. Inst. Ceylon*, i, pt. 3, pp. 77–79. Nuwara Eliya, August 1928.

In Ceylon *Brevipalpus obovatus*, Donn. (scarlet mite) has been recently observed on *Acacia melanoxylon, Salvia coccinea* and several Composites; all of these were growing in the neighbourhood of other infested food-plants. On *Grevillea*, 5–7 ft. high, red spider [*Tetranychus bioculatus*, W.M.] also occurred, no mites being found on the seedlings or full-grown trees. Caterpillars of *Boarmia acaciaria*, Boisd., have lately been taken on tea bushes. *Psyche vitrea*, Hmpsn., and *Chalia doubledayi*, Westw., have been recently found on *Albizzia*; larvae of the former caused complete defoliation of many of the plants, and those of the latter fed on the bark as well as the leaves. *Pseudococcus maritimus*, Ehrh., has occurred on the roots of *Albizzia lopantha*. *Xyleborus fornicatus*, Eichh. (shot-hole borer) is recorded from *Derris robusta*, to which it spread from tea. An Aphid has been observed on trees of *Gliricidia*, 2–3 years old, producing wilting of the young shoots. Other pests recorded are also mentioned in the preceding paper.

RIPLEY (L. B.) & HEPBURN (G. A.). **Top-dressing Maize against Stalk-borer.**—*Fmg. S. Afr.*, reprint no. 63, 5 pp. Pretoria, August 1928.

Further attempts have been made in S. Africa to discover a cheaper and more powerful insecticide that can be applied to the tops of early-planted maize against the stalk-borer [*Busseola fusca*, Fuller] [*cf. R.A.E.*, A, xvi, 647].

Insecticide powders can be used dry at much higher concentrations than when diluted with water without scorching the foliage, but at the same concentration their killing-power is much lower. Of the powders tested, pulvex (ground derris root) proved to be the best; it would probably not give good results if diluted with road dust at less than 1 : 25 by weight, but can be safely used at any concentration. The cost at the above strength is 2*s*. 6*d*. an acre exclusive of labour, a teaspoonful being applied to each plant.

The use of liquids whenever possible is recommended. Kymac (a sheep dip containing derris) diluted at about 1 : 250 gives general satisfaction, and costs 1*s*. 2*d*. an acre, a dessertspoonful being poured into every plant. With a severe attack, however, the powder diluted in water to the highest extent that can be afforded would be more effective; at 1 : 450 it is equal to the liquid at 1 : 250 in both killing power and cost. Of the various fluorine compounds tried, cryolite, an aluminium ore from Greenland, showed the highest toxicity in proportion to the amount of leaf scorching produced; when mixed in water at 1 : 600, it is as effective as kymac at 1 : 300, and costs 2*d*. or 3*d*. an acre. Further tests with this are necessary before its general use can be advised.

VAN POETEREN (N.). **Vraagstukken in verband met ziektebestrijding in de fruitteelt.** [Problems in Connection with Fruit-growing.]—*Tijdschr. Plantenziekt.*, xxxiv, no. 8, pp. 211–229. Wageningen, August 1928.

The Chalcid, *Aphelinus mali*, Hald., imported into Holland against the woolly apple aphis [*Eriosoma lanigerum*, Hausm.],was distributed in 80 localities in 1926, but had not, up to July 1928, given rise to large colonies. The problem of Aphids infesting the leaves of fruit-trees has been solved by the use of carbolineum, which also is effective against the eggs of *Psylla mali*, Schmidb., and *Cheimatobia brumata*, L. The latter has been a serious pest of cherry and apple, but adhesive banding has enabled it to be checked.

WILKE (S.). **Schädlinge der Gurken.** [Pests of Gherkins.]—*Flugbl. biol. Reichsanst. Land- u. Forstw.*, no. 96, 4 pp., 2 figs. Berlin, June 1928.

The leaves and shoots of gherkins are attacked in Germany by *Tetranychus telarius*, L. (*althaeae*, v. Hanst.), *Heliothrips haemorrhoidalis*, Bch., *Halticus saltator*, Geoffr., *Trialeurodes vaporariorum*, Westw., and *Aphis gossypii*, Glov. Brief notes on the life-history and control of these pests are given.

WILLE (J.). **Die wichtigsten tierischen Schädlinge des Kopfsalates.** [The most important Animal Pests of Lettuce.]—*Flugbl. biol. Reichsanst. Land- u. Forstw.*, no. 97, 4 pp., 5 figs. Berlin, July 1928.

In Germany the leaves, stems and roots of lettuce are attacked by Noctuids, especially *Euxoa* (*Agrotis*) *segetum*, Schiff., *Agrotis pronuba*, L., and *Polia* (*Mamestra*) *oleracea*, L. The collection of the larvae or their destruction by means of arsenical baits and the use of light-traps against the moths are the measures recommended. Less injurious are the Aphids, *Aphis papaveris*, L., *Macrosiphum ribicola*, Kalt., and *M. sonchi*, L. In greenhouses fumigation with cyanogas calcium cyanide is advisable; in the field, soap or nicotine sprays may be used. Pests of the flower-heads and seeds have already been noticed [*R.A.E.*, A, xvi, 592].

PAPE (H.). **Zum Frass der Gammaeulenraupe auf Kartoffelschlägen.** [The Injury done by the Caterpillar of *Phytometra* (*Plusia*) *gamma* in Potato Fields.]—*NachrBl. deuts. PflSchDienst*, viii, no. 9, pp. 81–82, 1 fig., 7 refs. Berlin, September 1928.

Phytometra (*Plusia*) *gamma*, L., was very abundant during the summer in various parts of northern and central Germany, and considerable injury was caused to potatoes, the plants being sometimes completely defoliated. In Brandenburg on 10th August up to 15–20 pupal cocoons were found on each bare plant. The few larvae noticed were remarkably sluggish, and subsequent examination showed them to be diseased, while many of the cocoons were parasitised. Only certain varieties of potato had been attacked, but it is possible that this was due to external factors, especially the manner and date of manuring. It is remarkable that, while potatoes, which are not a preferred food-plant, were attacked, favourite food-plants such as flax and beet suffered little.

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SCHILDER (F. A.) & SCHILDER (M.). **Die Nahrung der Coccinelliden und ihre Beziehung zur Verwandtschaft der Arten.** [The Food of Coccinellids and its Connection with the Relationship of the Species.]—*Arb. biol. Reichsanst.*, xvi, no. 2, pp. 213–282, 881 refs. Berlin, July 1928.

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OSBORN (H.). **The Leafhoppers of Ohio.**—*Ohio State Univ. Bull.*, xxxii, no. 27 (*Biol. Surv. Bull.* 14), pp. 199–374, 111 figs. Columbus, Ohio, 31st May 1928.

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* In view of the divergent opinions on the identity of the Aphids of this group, no attempt is here made to show the synonymy.

Aphis, Black Cherry (see *Myzus cerasi*).

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Aphis, Leaf-curling Plum (see *Anuraphis helichrysi*).

Aphis, Lily (see *Myzus circumflexus*).

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Aphis, Water-lily (see *Rhopalosiphum nymphaeae*).

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Apple Bud Moth (see *Argyroploce variegana* and *Eucosma ocellana*).

Apple Capsid (see *Plesiocoris rugicollis*).

Apple Curculio (see *Tachypterellus quadrigibbus*).

Apple Fruit Miner (see *Argyresthia conjugella*).

Apple Fruit Sawfly (see *Hoplocampa testudinea*).

Apple Grain Aphis (see *Rhopalosiphum prunifoliae*).

Apple Leaf Sucker (see *Psylla mali*).

Apple Root Borer, Giant (see *Prionus californicus*).

Apple Tent Caterpillar (see *Malacosoma americana*).

Apple and Thorn Skeletoniser (see *Hemerophila pariana*).

Apple Web Moth (see *Hyponomeuta malinellus*).

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Aptinothrips rufus, hibernation of, in Germany, **290**; possibly on wheat in Italy, **472.**

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zonata, Sagaritis.

zonellus, Chilo.

Zonocerus variegatus, food-plants of, in Sierra Leone, **244, 246.**

Zophosis agaboides, measures against, on tobacco in Nyasaland, **75.**

Zosmenus (see *Piesma*).

zwicki, Anisoplia.

Zygina (see *Erythroneura*).

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